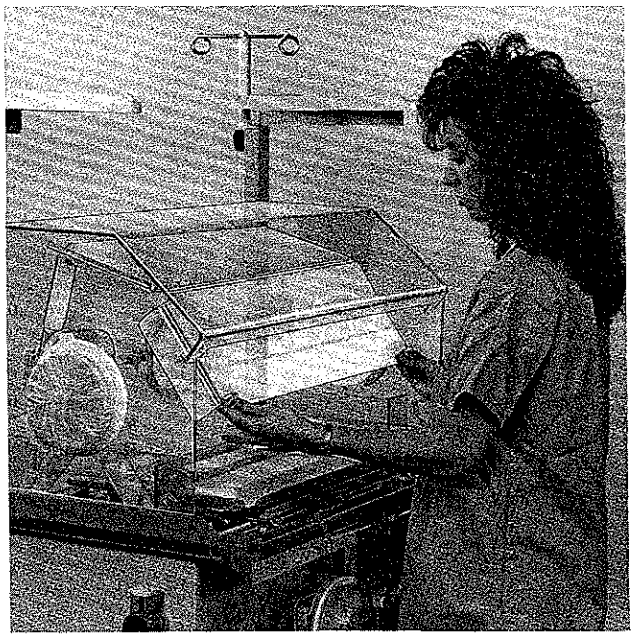
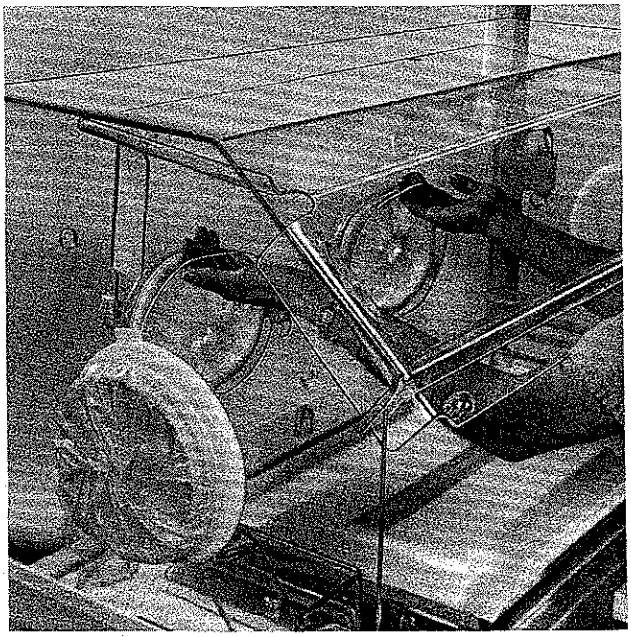
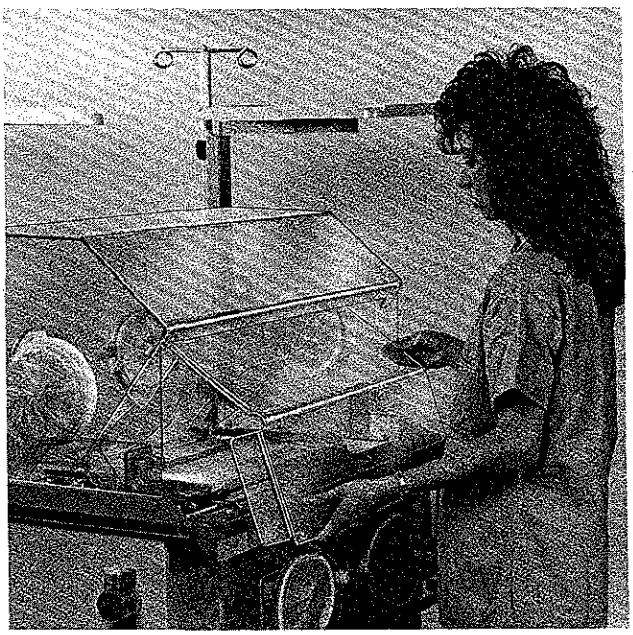


1. **RELEASE THE INNER WALL** by pushing slightly back in the direction of hood slopes, then down,



2. **Release REAR OF INNER WALL** while resting front edge of inner wall on your arm; lift rear of inner wall, pull toward you to release, then lower.

3. **LOWER REAR OF INNER WALL AS FAR AS IT WILL GO**



4. **REMOVE INNER WALL** by lowering in direction shown.

FIGURE 4.3 REMOVAL OF INNER WALL*

* Double Wall Hood only.

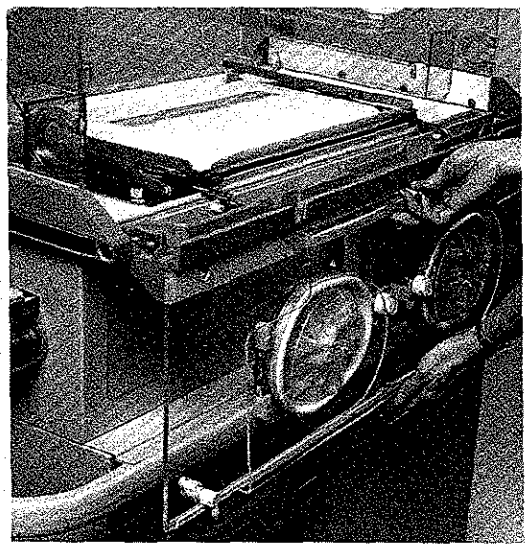


FIGURE 4.4 ACCESS PANEL INNER WALL REMOVAL*

6. **REMOVE MAIN DECK.** Rotate the Main Deck Retainer (Figure 4.5) parallel with the slot, then lift out the Main Deck and Hood Seat Gasket.

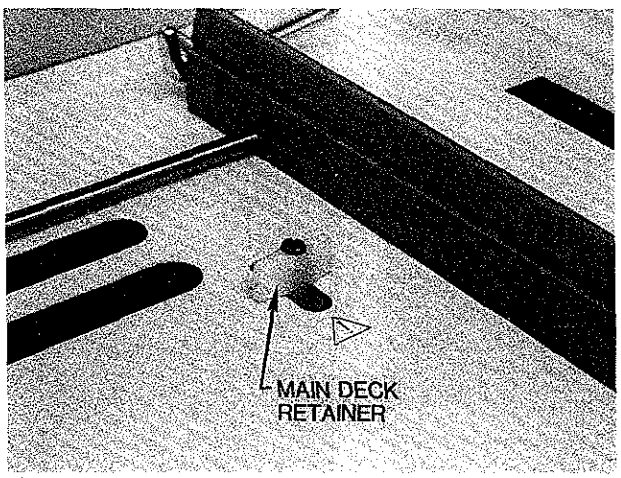


FIGURE 4.5 REMOVAL OF MAIN DECK

* Double Wall Hood only.

7. **REMOVE AIR INTAKE TUBE.** Grasp the Air Intake Tube (Figure 4.6), twist and pull it toward the front of the Incubator until the end of the tube clears the gasket. Remove the tube from the base assembly.

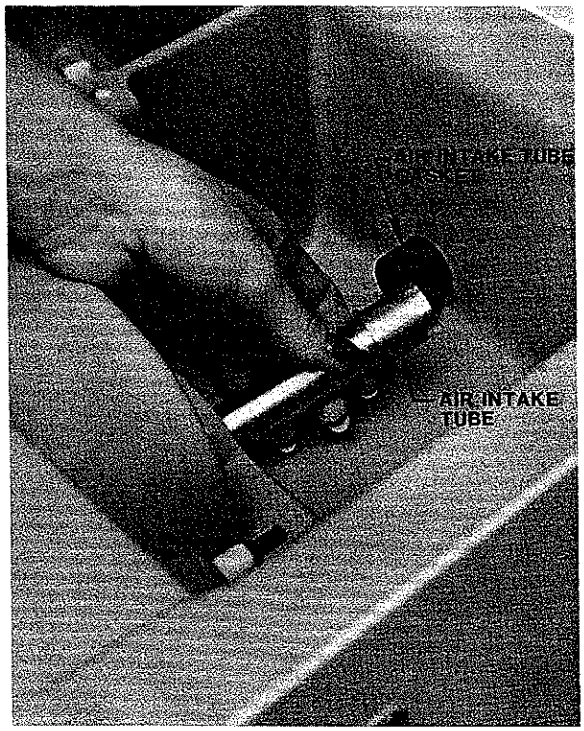


FIGURE 4.6 REMOVAL OF AIR INTAKE TUBE

8. **REMOVE DISPOSABLE ACCESS DOOR CUFF** from each Access Door Gasket by pulling it off from the outside; discard the cuffs.
9. **REMOVE ACCESS DOOR GASKET** from each Access Door hole by pulling it off from the outside.
10. **REMOVE TUBING ACCESS PORTS** from each side of the Hood by pulling them free.
11. **REMOVE DISPOSABLE IRIS ENTRY PORT SLEEVES** by pulling each Sleeve off the retainer rings; discard the sleeves.
12. **REMOVE THE AIR INTAKE MICROFILTER COVER** by loosening the two thumbscrews.

4.2.2 CLEANING

1. **CLEANING AGENTS.** An iodophor or quaternary disinfectant detergent registered by the U.S. Environmental Protection Agency should be used, but only after the Incubator is empty and disassembled as described in paragraph 4.2.1. A cleanser such as Air–Shields Kleenaseptic® Germicidal Surface Cleanser may be used. When using any cleaning agent follow the manufacturer's directions for use. After removing all solid wastes and contaminants from the disassembled parts, clean them as follows:
2.* **SKIN PROBE.** Use a disinfectant–detergent to thoroughly clean all surfaces, then dry with a clean cloth or paper towel.

* Model C100 only.

3. **HUMIDITY CHAMBER AND FILL PIPE, AIR INTAKE TUBE, ACCESS DOOR GASKETS, TUBING ACCESS PORTS, AND MAIN DECK GASKET.** Fill the humidity chamber with a disinfectant–detergent, then remove the W–shaped Baffle from the chamber and dry it with a clean cloth or paper towel. Place the Air Intake Tube, Access Door Gaskets, Tubing Access Ports, and Main Deck Gasket into the solution.

   NOTE: If necessary, a larger container may be used, but if the chamber is not used, then the Fill Pipe and Humidity Chamber must be cleaned separately.

   Allow them to soak as recommended by the cleaning solution manufacturer, then remove them and dry completely with a clean cloth or paper towel. Drain the Humidity Chamber, scrub it thoroughly including all indentations, then dry the chamber and Fill Pipe (inside and out) with a clean cloth or paper towel.

   If it is necessary to remove the fill pipe for cleaning, rotate the Fill Pipe Assembly about 1/4 turn to the left. Loosen the thumbscrew that secures the Fill Pipe Bracket, and rotate the bracket 1/4 turn to the left. Unscrew the Fill Pipe Assembly by rotating counterclockwise as shown in Figure 4.7. Clean Fill Pipe Assembly and the sleeve that becomes a loose part when the Fill Pipe Assembly is unscrewed.

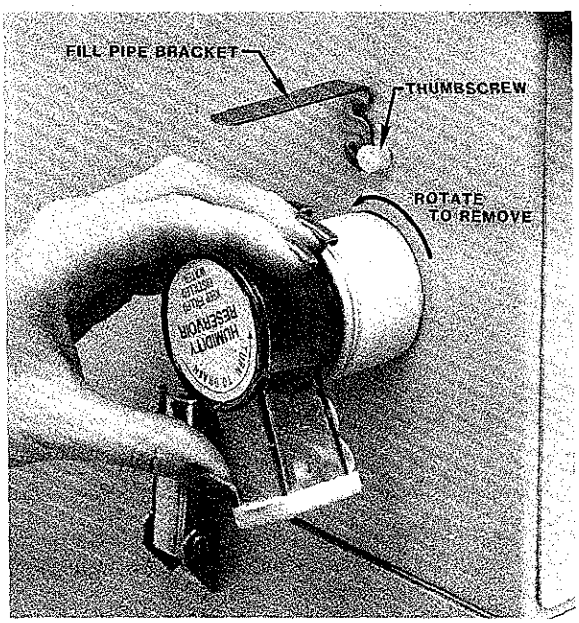


FIGURE 4.7 REMOVAL OF HUMIDITY FILL PIPE ASSEMBLY

4. **CONTROLLER.** The portions of the Controller external to the controlled incubator environment include the front panel and the top, bottom, and two sides of the chassis. These portions may be wiped clean with a cloth dampened with a disinfectant–detergent.

CAUTION: Some chemical cleaning agents may be conductive and/or leave a residue which may permit a build–up of dust or dirt which may be conductive. Do not permit cleaning agents to contact electrical components. Do not spray cleaning solutions onto any of these surfaces.

The portions of the Controller that are within the Incubator's controlled environment are on the rear surface: included are the air temperature probe, the fan impeller, the heater, the gaskets, and the surface of the Controller to which these components are mounted.

CAUTION: Failure to clean could result in sufficient lint build–up to reduce air flow, which will affect temperature control and cause high oxygen concentrations.

A. Remove any lint build–up, pay particular attention to the fan impeller, heater, air temperature probe, and air flow sensor.

B. Clean these surfaces with a disinfectant–detergent, then dry with a clean cloth or paper towel.

NOTE: A disinfecting tank is available as an accessory from Air–Shields to facilitate cleaning the rear surface of the Controller. The Controller rear surface is immersed into the tank after filling it with a disinfectant–detergent, then allowing it to soak as recommended by the manufacturer of the cleaning solution.

5. **MATTRESS TRAY, AIR CURTAIN COVER, MAIN DECK.** Use a disinfectant–detergent to clean all surfaces thoroughly, then dry with a clean cloth or a paper towel.

6. **MATTRESS TILT CONTROL, C100/200 QT (SERIES –02) INCUBATORS. REMOVE ALL SOLID WASTES** and contaminants from the Mattress Tilt Control. An iodophor or quaternary disinfectant–detergent registered with the U.S. Environmental Protection Agency should be used to clean the mechanism. A cleanser such as Kleenaseptic® Germicidal Surface Cleanser may also be used. When using any cleaning agent follow the manufacturer's directions for use.

WARNING: DO NOT lubricate elevator tilt mechanism with oil or other potentially flammable material in an enriched oxygen environment.

7. **HOOD AND CABINET STAND.** Use a disinfectant–detergent to clean all surfaces of the hood thoroughly, including the inner wall and access door heat shield*. Make sure to clean all holes, indentations, baffles, etc., then dry with a clean cloth or paper towel. Clean the exposed surfaces of the cabinet stand.

CAUTION:

Alcohol can cause crazing of the clear acrylic Hood. Do not use alcohol for cleaning.

Do not expose the hood assembly to direct radiation from germicidal lamps. Ultraviolet radiation from these sources can cause cracking of gaskets, fading of paint, and crazing of the clear acrylic Hood.

8. **AIR INTAKE MICROFILTER.** Do not attempt to clean or reverse the microfilter. If visibly dirty, or older than 3 months, it should be replaced. Before installing a new filter, clean the Microfilter chamber and cover with a disinfectant–detergent.

> **WARNING: A dirty Filter may affect oxygen concentration and/or cause carbon dioxide build–up. Be sure the filter is checked on a routine basis commensurate with local conditions.**

** Model C100 only. (Optional in C200).

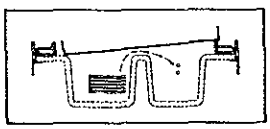
4.2.3 REASSEMBLY AFTER CLEANING

IMPORTANT: Specific Assemblies (Inner Walls, Main Deck, Mattress Tilt Mechanisms, Oval Gaskets) are not interchangeable between the C100/200 Series –01 and the C100/200 QT Series –02 Incubators. Verify proper identification of components prior to assembly.

After cleaning all parts and assemblies as described in paragraph 4.2.2, reassemble as described below.

1. **INSTALL THE AIR INTAKE TUBE** (into the Base Assembly) by reversing the procedures shown in Figure 4.6.
2. **INSERT HUMIDITY CHAMBER BAFFLE** into the Humidity Chamber.
3. **INSTALL THE MAIN DECK AND HOOD SEAT GASKET** into the Base Assembly as shown in Figure 4.8. Rotate the Main Deck Retainer (Figure 4.5) to secure the deck.

WRONG MAIN DECK POSITION-Main deck placed up on gasket on one side, permitting air flow as shown by dashed line.



CORRECT MAIN DECK POSITION-Main deck placed down on conditioning chamber top.

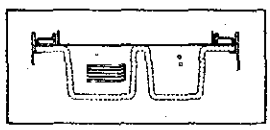


FIGURE 4.8 INSTALLATION OF MAIN DECK AND HOOD SEAT GASKET

4. **INSTALL THE MATTRESS TILT MECHANISMS C100/200 QT SERIES –02** on the Main Deck. (Refer to Figure 4.2.)

NOTE: There is a right–hand and left–hand tilt mechanism.

CAUTION: Be sure the two thumbscrews that hold the tilt mechanism to the deck are tightened securely.

5. **INSTALL THE AIR CURTAIN COVER AND MATTRESS TRAY.**

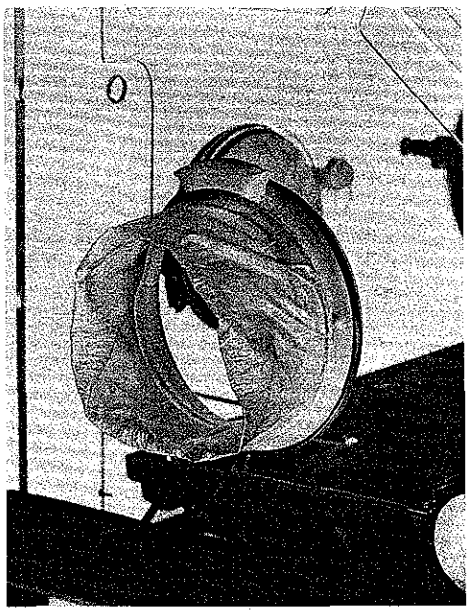
WARNING: The Air Curtain Cover must be properly installed for correct temperature control.

Hook the lip on the bottom of the Air Curtain onto the rod at the rear of the Main Deck Assembly, then lower the cover toward the front of the Incubator to the rest position. Close the Hood Assembly and check for proper operation of the Air Curtain Cover. The Air Curtain Cover is operating correctly if it rises slightly when the Access Panel is opened. Install the Mattress Tray by positioning it a few inches above the mattress rails, then lowering straight down.

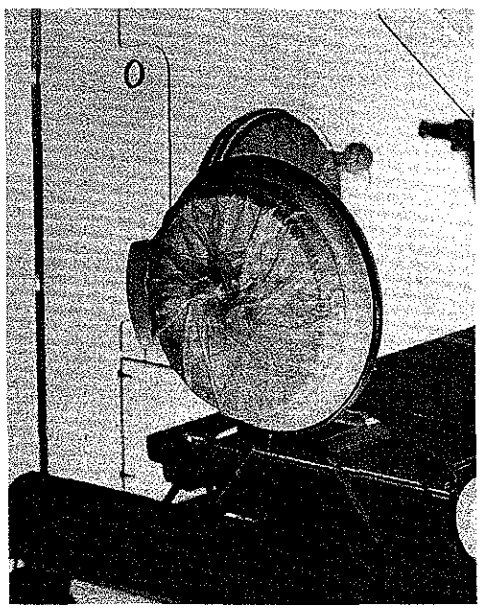
6. **INSTALL DISPOSABLE MATTRESS COVER.** Place a new disposable Mattress Cover over the mattress, then place the mattress onto the tray.
7. **INSTALL DISPOSABLE IRIS ENTRY PORT SLEEVES.** Install a new Iris Entry Port Sleeve as shown in Figure 4.9.

NOTE: If the Incubator is to be gas sterilized, wait until after sterilization to install new sleeves.

1. Install the smaller diameter elastic band of a new sleeve over the inner ring of the port housing



2. Fold back and slip larger elastic band over the outer ring of the pot housing.



3. Rotate outer ring to close, if properly installed, the sleeve will open again if rotation is reversed.

FIGURE 4.9 INSTALLATION OF IRIS ENTRY PORT SLEEVE

8. **INSTALL A TUBING ACCESS PORT** into the front edge of each side of the Hood. Replace if distorted or torn.
9. **INSTALL AN ACCESS DOOR GASKET** behind each Access Door, as shown in Figure 4.10.

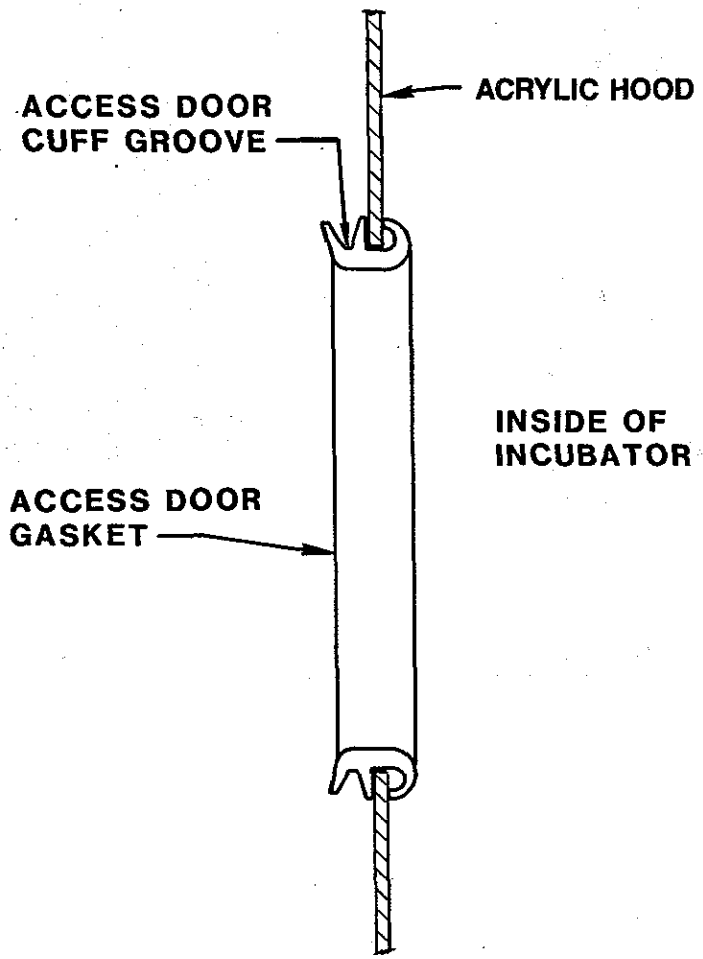


FIGURE 4.10 INSTALLATION OF ACCESS DOOR GASKET

10. **INSTALL A NEW ACCESS DOOR CUFF** onto each Access Door Gasket by stretching the larger diameter elastic band into the groove in the gasket. When installed correctly, the cuff has a small opening at its center. The Access Door should latch with slight pressure, and should open when the latch button is depressed.

NOTE: If the Incubator is to be gas sterilized, wait until after sterilization to install new sleeves.

11. **INSTALL HOOD INNER WALL** by reversing the procedure shown in Figure 4.2.
12. **INSTALL THE HEAT SHIELD** onto the Access Panel.
13. **INSTALL A NEW AIR INTAKE MICROFILTER** if necessary. Replace the Air Intake Microfilter Cover and tighten the two thumbscrews. If a new filter is installed, indicate the date on the place provided on the cover.

IMPORTANT: A complete operational checkout (paragraph 2.4) should be performed before returning the unit to service.

4.3 GAS STERILIZATION

Prior to gas sterilization, the entire Incubator should be thoroughly cleaned as described elsewhere in this section. All used disposable elements such as iris sleeves, access door cuffs, mattress covers, etc., should be removed and discarded as described in the cleaning instructions. New disposable elements should be installed after sterilization.

Release the Controller latches and slide the unit out about 1/4". The Access Panel may be closed, but the Access Doors should be left open. The Air Intake Microfilter may be left in place.

NOTE: Gas sterilization does not eliminate the need for routine replacement of the Air Intake Microfilter.

CAUTION: Sterilization temperature should not exceed 130 ° F (54.5 °C).

Standard Gas sterilization procedures as programmed by automatic equipment such as made by American Sterilizers and Wilmot Castle are satisfactory as these do not normally exceed 130 °F (54.5 °C).

Upon completion of gas sterilization, an aeration period of 16 to 24 hours should be allowed. The Control unit should be properly secured in place and the C100 Incubator should be operated in a dry condition for the entire period of aeration at a temperature of 32 to 35 °C. After aeration, if the unit is not to be used immediately, a disposable dust cover should be placed on the Incubator.

IMPORTANT: A complete operational checkout procedure (paragraph 2.4) should be performed before returning the unit to service.

4.4 CALIBRATION SCHEDULE

It is recommended that the Controller of the Incubator be tested and calibrated at least annually and after repairs have been made. Calibration and test procedures are provided in Section 5 of this manual.

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SECTION 5
SERVICE

5.1 GENERAL

This section provides calibration, troubleshooting, and removal and replacement instructions for the Model C100 and C200 Incubators.

IMPORTANT: It should be noted that the terms "SET TEMP" and "SET POINT" are used interchangeably in this manual.

5.2 CALIBRATION PROCEDURES

WARNING: The Motor Assembly is not grounded. Under fault conditions, the metal frame may be at mains potential.

5.2.1 GENERAL

This paragraph provides calibration procedures for the Controllers and tests for the Incubator.

Unless otherwise indicated, all calibration procedures are performed under the following conditions:

1. The Controller is removed from the Incubator and the cover is removed.
2. The Controller is connected to a primary source of the correct voltage and frequency.
3. Primary power applied to the Controller for a minimum of ten minutes before calibrating.

5.2.2 TEST EQUIPMENT REQUIRED

The test equipment listed below is required for calibration of the Controller and performing Oxygen Concentration tests. Equivalent test equipment may be substituted.

- Probe Simulator, Part No. 68 900 80
- Logic Probe – capable of +/– 12 Vdc
- Variable Transformer, General Radio Model WSM T3AW
- Digital VOM, Fluke Model 8060A
- Oxygen Analyzer, Ametek, Thermox Instrument Division, Model S–3A1, Pittsburgh, PA.
- Flowmeter, Victor – Model 1099–0025
- Leakage Current Tester, Bio–Tek 501

(Change 16)

5.2.3 PCB2 – MODEL C100

TEST SETUP

1. Connect the Simulator to the PATIENT PROBE and AUXILIARY PROBE jacks on the Side Panel of the Controller. Connect the ac line cord through a variac and turn on the unit. Set the variac as follows: 120 +/– 2V~ (110/120V Models); 240 +/– 2V~ (220/240V Models); 100 +/– 2V~ (100V Models).
2. On the Controller, set the AIR and SKIN set Temp. switches to 36.0 °C. Set the CONTROL MODE switch to AIR.
3. On the Simulator, set the MODE switch to AIR and the TEMP switch to 36 °C. Refer to Figure 5.1 for location of test points and adjustments.

PROCEDURE

1. Refer to Figure 5.1 and connect the DVM between TP20 (+) and TP22 on PCB2.
2. Adjust R35 on PCB2 for a reading of –350 +/– 50 mV on the DVM.
3. On the Simulator, set the MODE switch to SKIN on the Controller, set the CONTROL MODE Switch to SKIN. Connect the DVM between TP13 (+) and TP22.
4. Adjust R50 for a reading of –350 +/– 50 mV on the DVM.
5. Turn off the POWER switch on the Controller. Connect the logic probe between +12 Vdc and ground. Monitor TP15 with the logic probe.
6. Turn the unit on. Set the variac as follows: 95 +/– 2V~ (110/120V Models); 190 +/– 2V~ (220/240V Models); 80 +/– 2V~ (100V Models). On PCB2, turn R100 fully counterclockwise.

6a. On the simulator, set the mode switch to AIR.

7. On the Controller, set the AIR SET TEMP Switch to 37 °C. Slowly turn R100 clockwise until the light on the logic probe just stays off constantly (full heater power).

7a. Set the variac as follows: 130 +/– 2 Vac (110/120V Models); 260+/– 2 Vac (220/240V Models); 108+/– 2 Vac (100V Models). The light on the logic probe should be on for approximately 50 percent of the time.

8. Set the variac as follows: 120 +/– 2V~ (110/120V Models); 240 +/– 2V~ (220/240V Models); 100 +/– 2V~ (100V Models). The light should go off for approximately four seconds (Heater On) and come on for approximately two seconds (Heater Off).
9. Turn off the Power. Remove the logic probe.

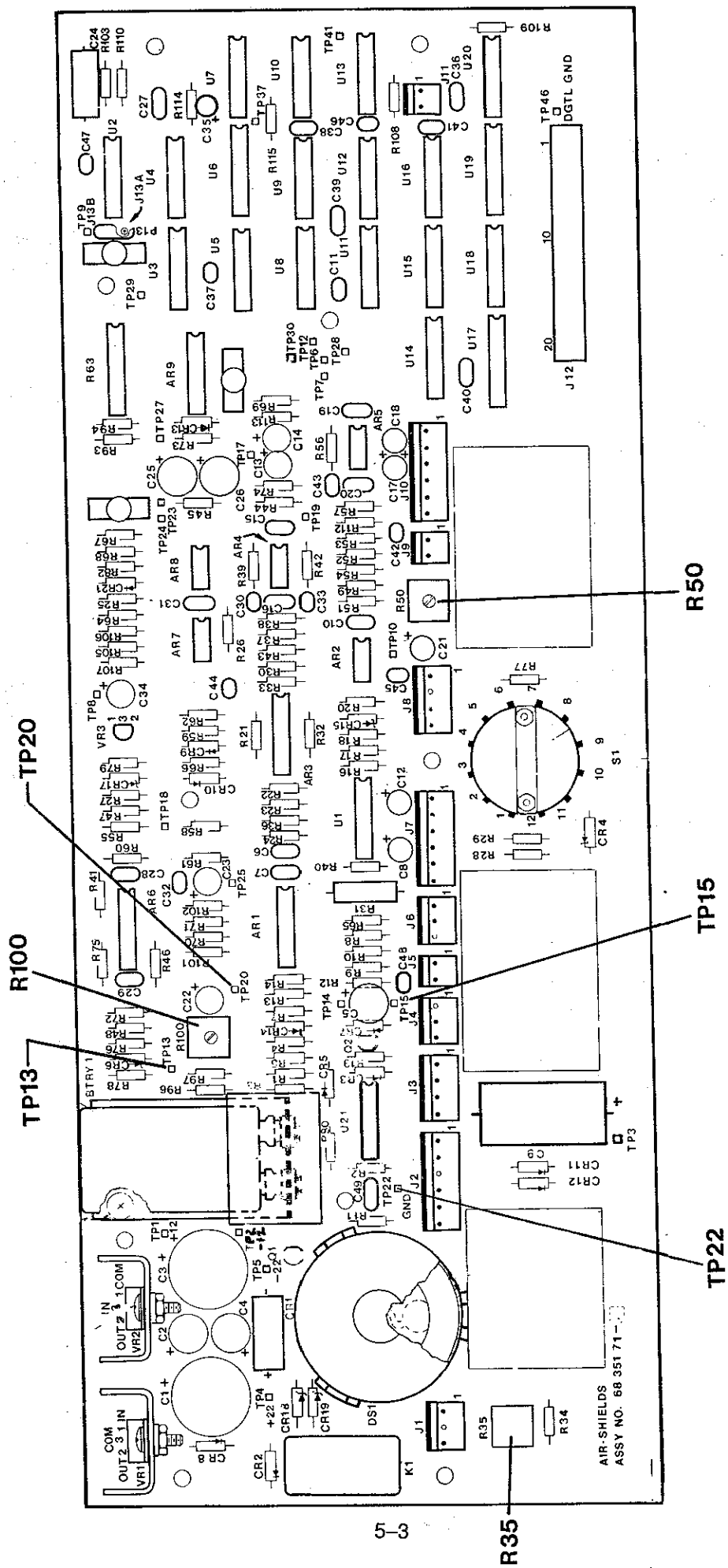


FIGURE 5.1 PCB2 (MODEL C100), LOCATION OF TEST POINTS AND ADJUSTMENTS

5.2.4 PCB1 – MODEL C100

TEST SETUP

1. Remove the CONTROL MODE knob. Remove the five screws which hold PCB1 and PCB2 to the Front Panel. Set PCB1 and PCB2 vertically behind the brackets located behind the SILENCE/RESET and POWER switches.
2. Connect the Simulator to the PATIENT PROBE and AUXILIARY PROBE jacks on the Side Panel. Set the Simulator to 36°C. Set the Controller and Simulator to SKIN mode. Refer to Figure 5.2. for location of test points and adjustments.

PROCEDURE

1. On PCB1, adjust R7 until the left display (SKIN) reads 36.0 +/– 0.1 °C.
2. Set the Simulator to 20 °C. Adjust R2 on PCB1 until the left display (SKIN) reads 20.0 +/– 0.1 °C.
3. Repeat steps 1 and 2 to ensure proper settings. Readjust if necessary.
4. Set the Simulator to AIR mode and 36.0 °C.
5. On PCB1 adjust R18 until the right display (AIR) reads 36 +/– 0.1 °C.
6. Set the Simulator to 20 °C. On PCB1 adjust R13 until the right display (AIR) reads 20+/– 0.1 °C.
7. Repeat steps 5 and 6 to ensure proper settings. Readjust if necessary.

5.2.5 PCB2 – MODEL C200

TEST SETUP

1. Connect the Simulator to the AUXILIARY PROBE jack on the Side Panel of the Controller. Connect the ac line cord through a variac and turn on the unit. Set the variac as follows: 120 +/–2V~ (110/120V Models); 240 +/– 2V~ (220/240V Models); 100 +/– 2V~ (100V Models).
2. On the Controller, set the SET TEMP °C switch to 36.0 °C.
3. On the Simulator, set the MODE switch to AIR and the TEMP switch to 36 °C. Refer to Figure 5.3 for location of test points and adjustments.

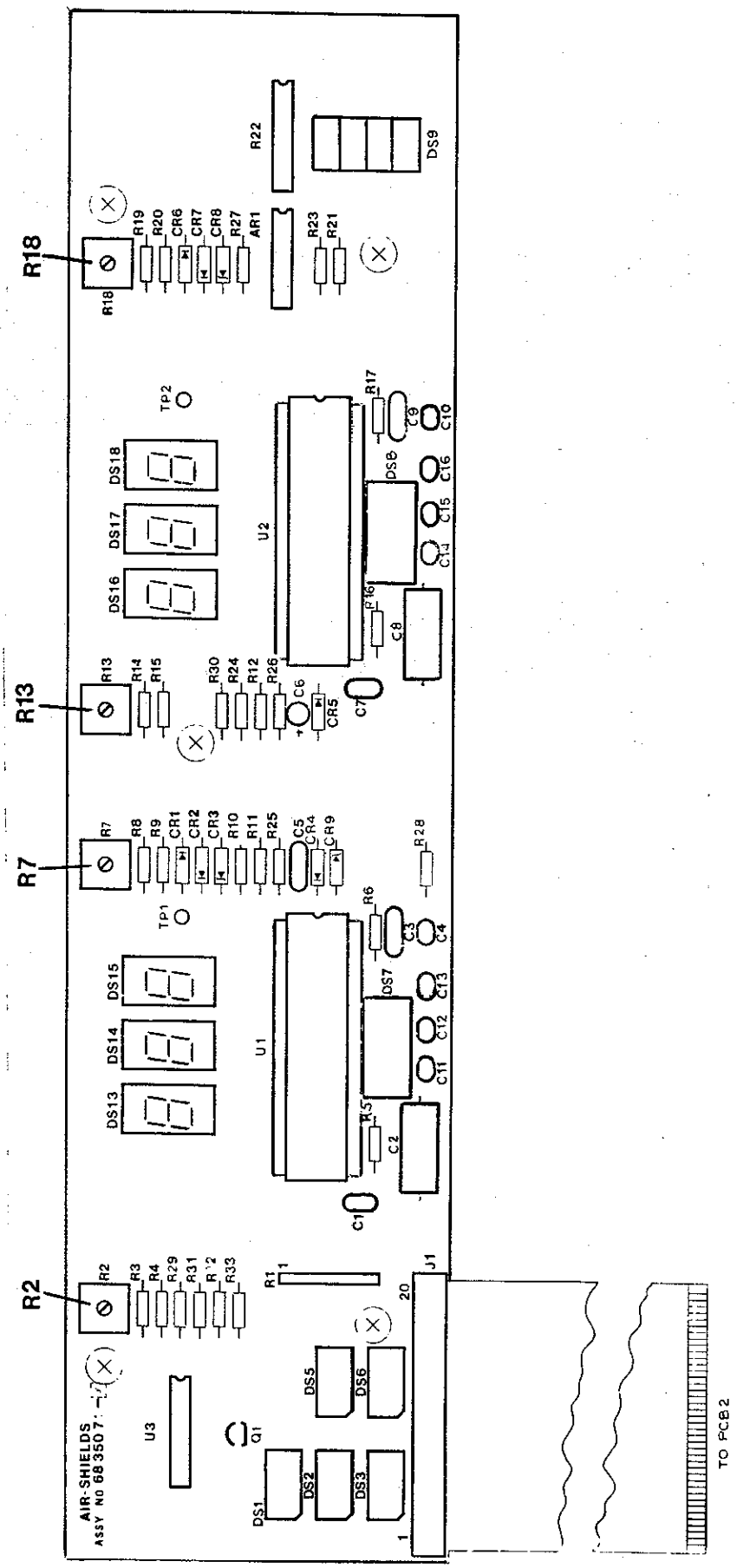


FIGURE 5.2 PCB1 (MODEL C100), LOCATION OF TEST POINTS AND ADJUSTMENTS

PROCEDURE

1. Refer to Figure 5.3 and connect the DVM between TP20 (+) and TP22 on PCB2.
2. Adjust R35 on PCB2 for a reading of –350 +/– 50mV on the DVM.
3. Turn off the POWER switch on the Controller. Connect the logic probe between +12 Vdc and ground. Monitor TP15 with the logic probe.
4. Turn the unit on. Set the variac as follows: 95 +/– 2 Vac (110/120V Models); 190 +/– 2 Vac (220/240V Models); 80 +/– 2 Vac (100V Models). On PCB2 turn R100 fully counterclockwise.
5. On the Controller, set the AIR SET TEMP Switch to 37°C. Slowly turn R100 clockwise until the light on the logic probe just stays off constantly (full heater power).

5a. Set the variac as follows: 130 +/– 2 Vac (110/120V Models); 260 +/– 2 Vac (220/240V Models); 108 +/– 2 Vac (100V Models). The light on the logic probe should be on approximately 50 percent of the time.

6. Set the variac as follows: 120 +/– 2 Vac (110/120V Models); 240 +/– 2 Vac (220/240V Models); 100 +/– 2 Vac (100V Models). The light should go off for approximately four seconds (Heater On) and come on for approximately two seconds (Heater Off).
7. Turn off the power. Remove the logic probe.

5.2.6 PCB1 – MODEL C200

TEST SETUP

1. Remove the five screws which hold PCB1 and PCB2 to the Front Panel. Set PCB1 and PCB2 vertically behind the brackets located behind the SILENCE/RESET and POWER switches.
2. Connect the Simulator to the AUXILIARY PROBE jack on the Side Panel. Set the Simulator to 36 °C. Set the Simulator to AIR mode. Refer to Figure 5.4 for location of test points and adjustments.

PROCEDURE

1. On PCB1 adjust R18 until the display reads 36 +/– 0.1°C.
2. Set the Simulator to 20 °C. On PCB1 adjust R13 until the display reads 20 +/– 0.1 °C.
3. Repeat steps 1 and 2 to ensure proper settings. Readjust if necessary.
4. Reassemble the Controller and disconnect the Simulator.

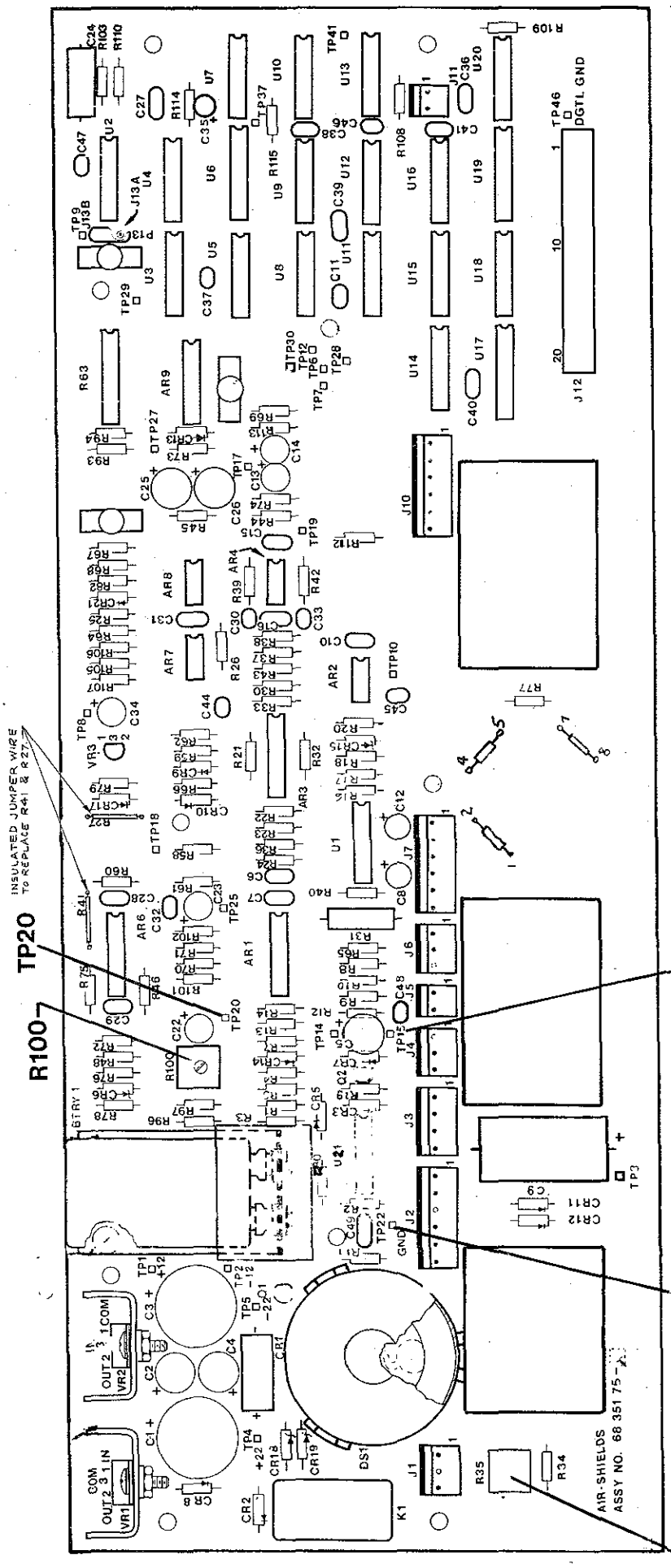


FIGURE 5.3 PCB2 (MODEL C200), LOCATION OF TEST POINTS AND ADJUSTMENTS

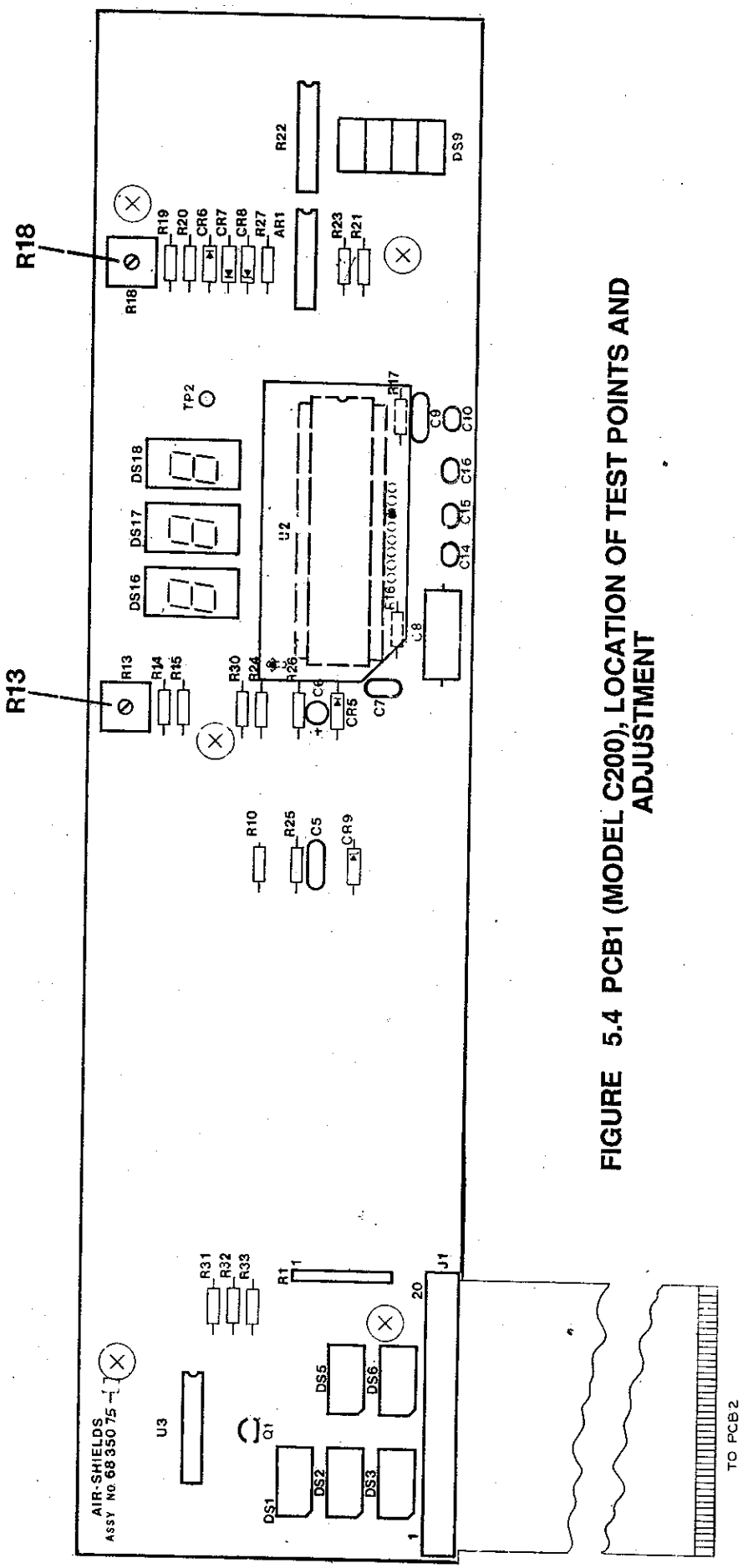


FIGURE 5.4 PCB1 (MODEL C200), LOCATION OF TEST POINTS AND ADJUSTMENT

5.2.7 LEAKAGE CURRENT TESTS

TEST SETUP

1. Connect the Controller to the primary power source through an ungrounded adapter plug, so that the unit is ungrounded. Turn the POWER switch on.
2. The leakage current test standards provided in the procedure below assume leakage through a resistance of 1000 ohms. If the Leakage Tester being used does not provide this resistance, the test set–up must be adjusted to provide it.

PROCEDURE

1. Use the Leakage Current Tester to measure between the chassis of the unit under test and a known ground such as the ground connection of a wall receptacle. The leakage current must not exceed 100 micro–amps in 120 Vac Units or 500 micro–amps in 220/240 Vac Units.
2. Reverse the plug and repeat step 1.
3. Perform steps 1 and 2 with the Controller POWER switch OFF.

5.2.8 OXYGEN CONCENTRATION TESTS

TEST SETUP

1. Place a calibrated oxygen analyzer on the mattress in the Incubator.
2. Apply oxygen at a flow rate of 8 LPM to the O_2 nipple on the Filter Cover.

PROCEDURE

1. Turn the unit ON.
2. After 40 minutes of operation, verify that the oxygen concentration level is between 37% and 52%.
3. Increase the Oxygen flow to 12 LPM. After another 40 minutes of operation, verify that the oxygen concentration level is between 65% and 95%.

5.3 TROUBLESHOOTING

WARNING: The Motor Assembly is not grounded. Under fault conditions, the metal frame may be at mains potential.

5.3.1 GENERAL

Troubleshooting guides for the Incubators and the Controllers are presented under paragraph 5.3.3 in the form of flowcharts. It is assumed that an attempt has been made to calibrate the unit and that all cables are in good condition.

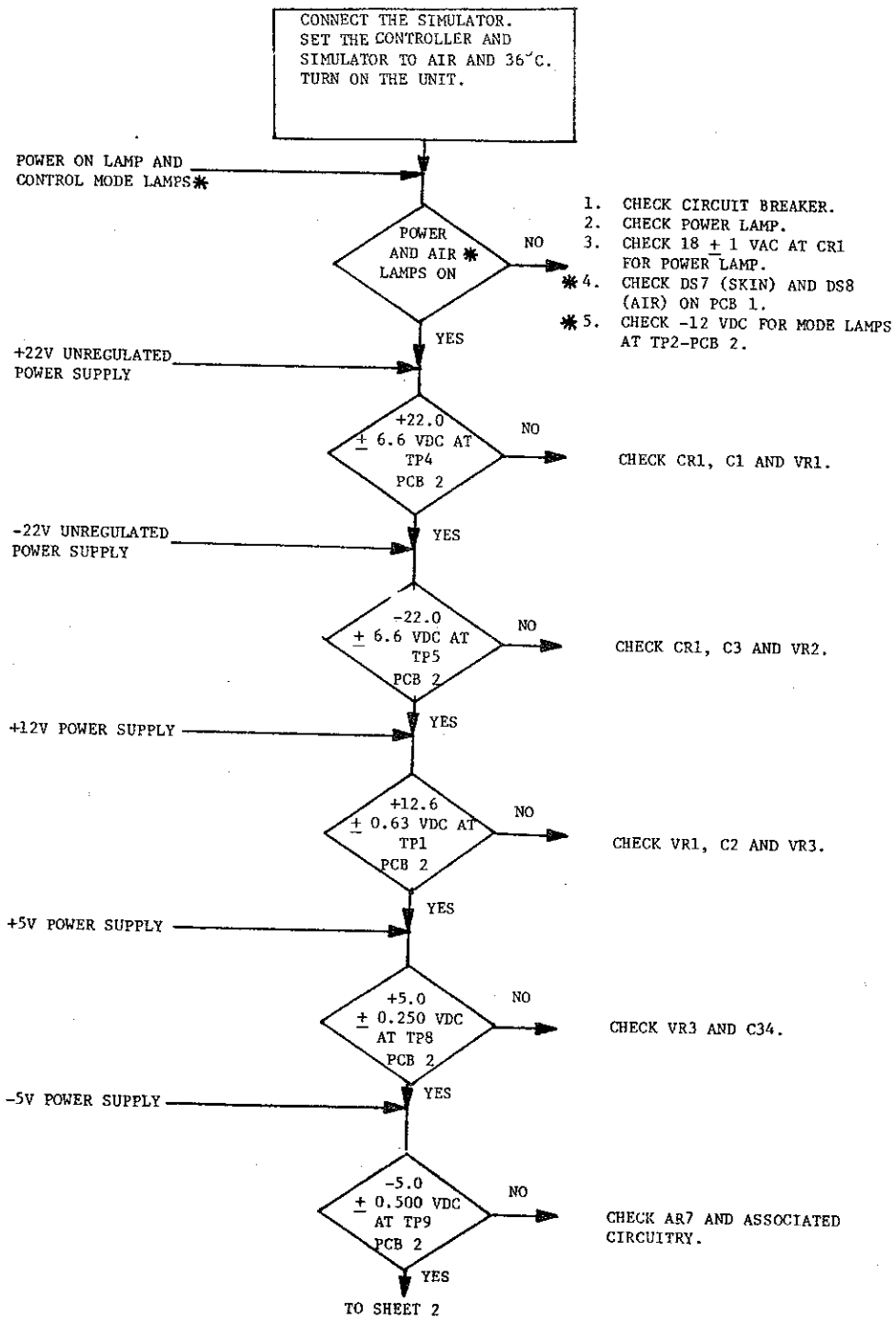
5.3.2 TEST EQUIPMENT REQUIRED

The test equipment listed below is required for troubleshooting the Controller of the Incubator. Equivalent test equipment may be substituted.

- Digital Voltmeter, Fluke Model 8060A
- Logic Probe – capable of 12 Vdc
- Oscilloscope,Tektronix Model 465
- Probe Simulator, Part No. 68 900 80
- Variable Transformer, General Radio Model WSM T3AW
- Resistor, 3.6 K, 1/4 Watt, 5%
- Resistor, 4.3 K, 1/4 Watt, 5%
- Resistor, 400 Ohms, 1/4 Watt, 5%
- Resistor, 100 Ohms, 1/4 Watt, 5%
- Oxygen Analyzer Flowmeter

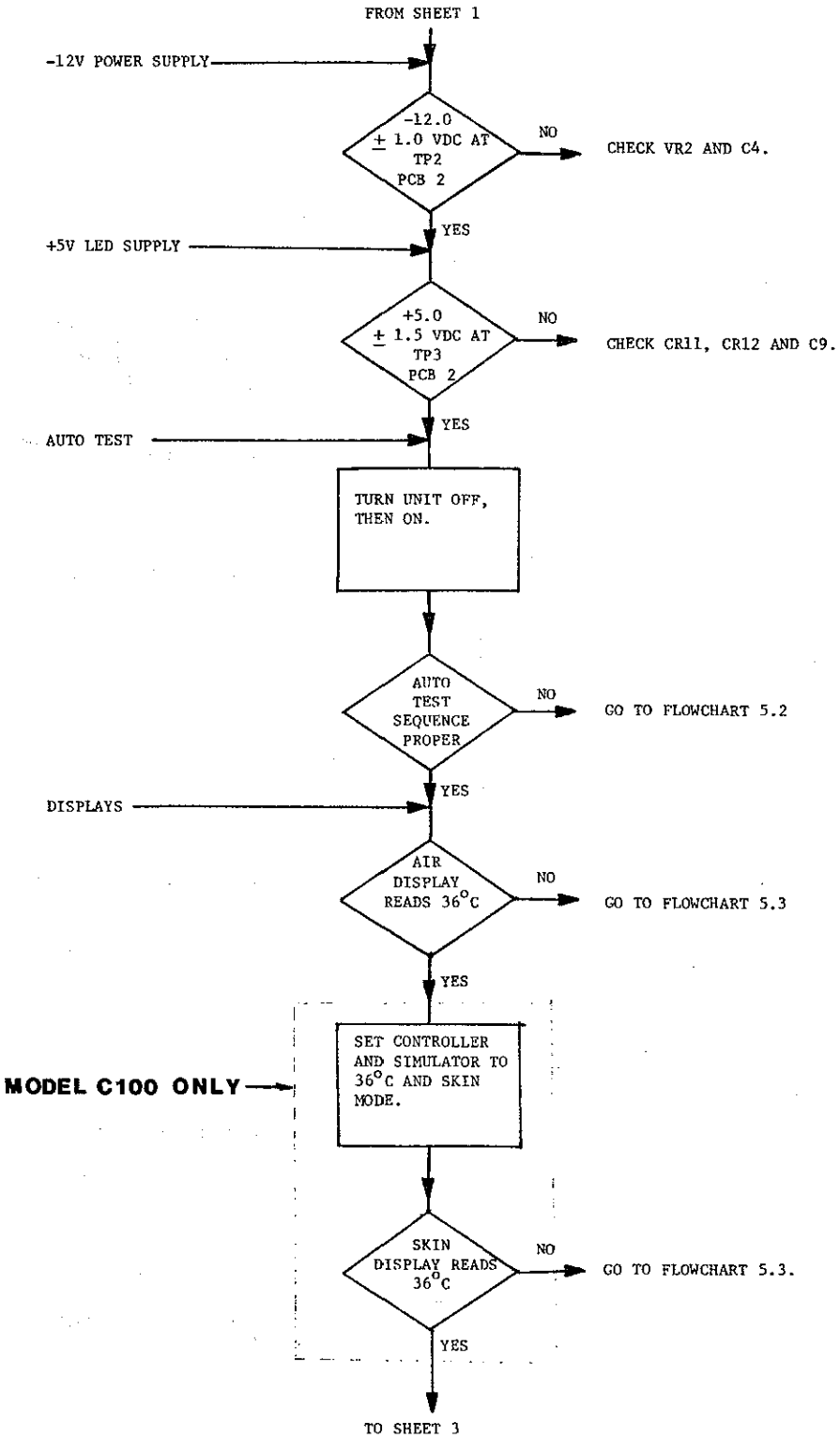
5.3.3 TROUBLESHOOTING PROCEDURES

Unless otherwise specified on the troubleshooting charts, all checks are made with the Controller plugged into an ac power source and the POWER switch is on. The troubleshooting charts assume that the calibration procedures described in paragraph 5.2 have been attempted. Flowcharts 5–14 and 5–15 assume that the Controller is in the Incubator.

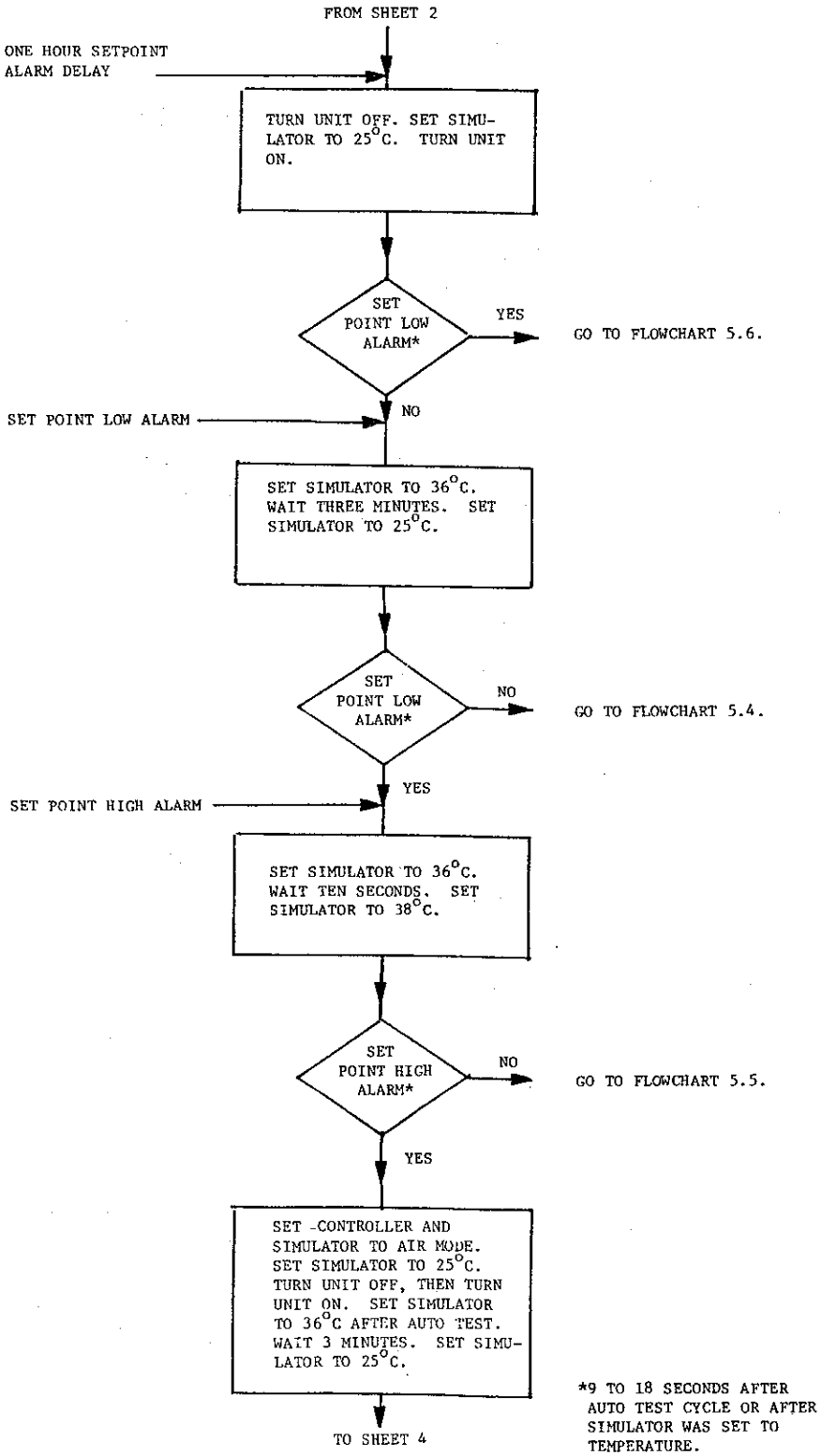


*** MODEL C100 ONLY**

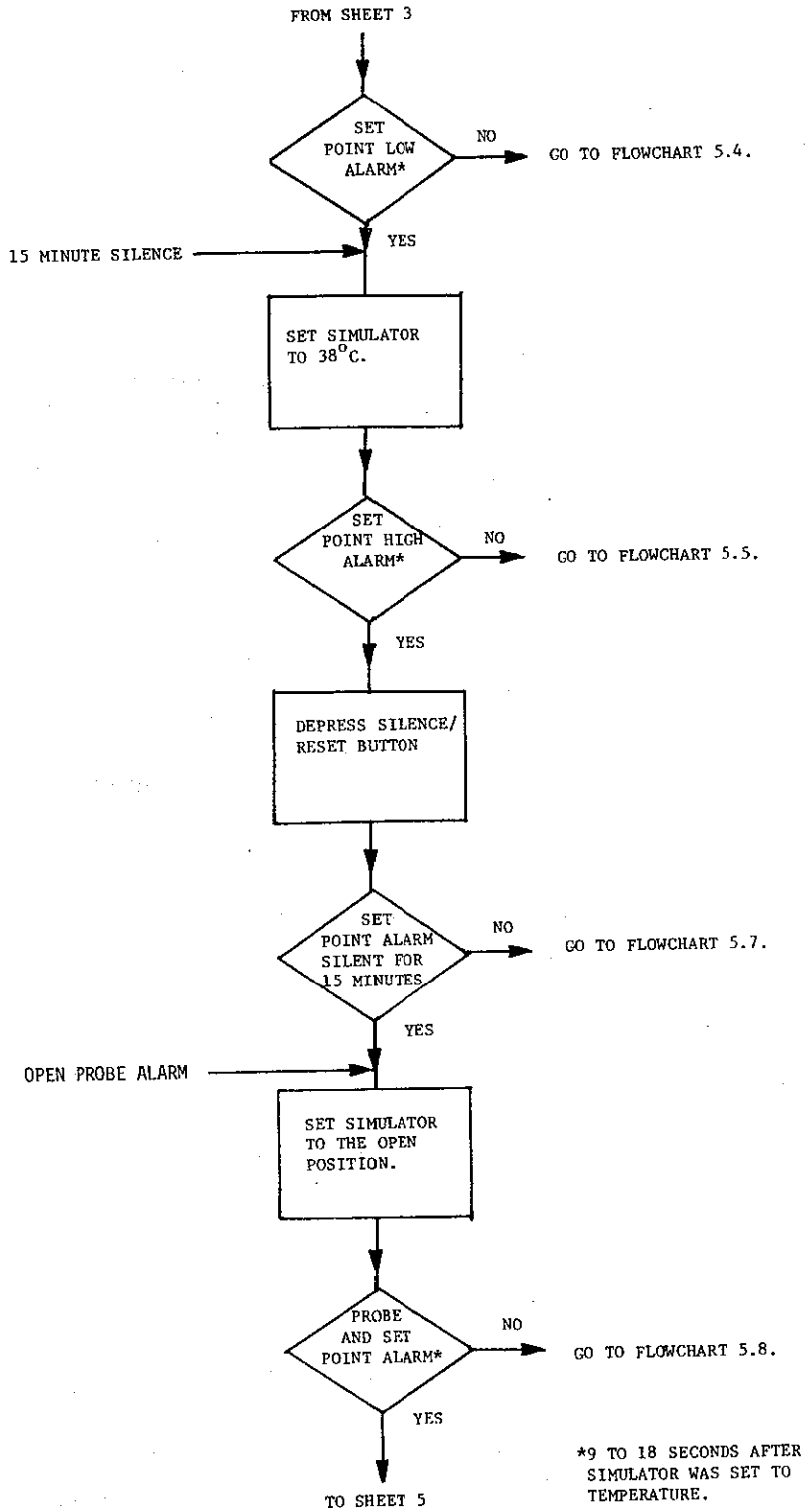
FLOWCHART 5.1 OVERALL CHECKS (SHEET 1 of 8)



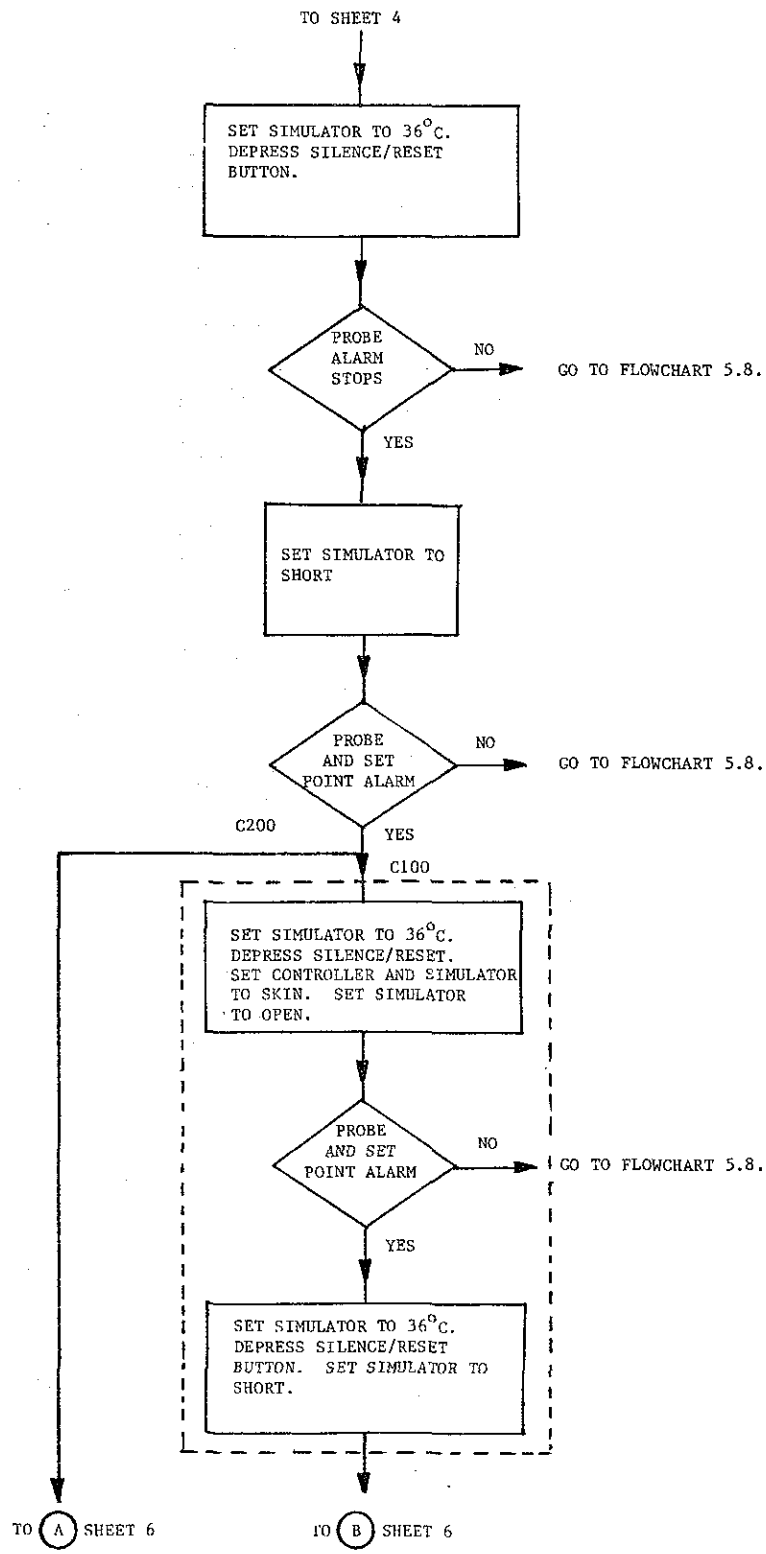
FLOWCHART 5.1 OVERALL CHECKS (SHEET 2 OF 8)


FROM SHEET 2
ONE HOUR SETPOINT ALARM DELAY
TURN UNIT OFF. SET SIMULATOR TO 25°C. TURN UNIT ON.
SET POINT LOW ALARM*
YES
GO TO FLOWCHART 5.6.
NO
SET POINT LOW ALARM
SET SIMULATOR TO 36°C. WAIT THREE MINUTES. SET SIMULATOR TO 25°C.
SET POINT LOW ALARM*
NO
GO TO FLOWCHART 5.4.
YES
SET POINT HIGH ALARM
SET SIMULATOR TO 36°C. WAIT TEN SECONDS. SET SIMULATOR TO 38°C.
SET POINT HIGH ALARM*
NO
GO TO FLOWCHART 5.5.
YES
SET CONTROLLER AND SIMULATOR TO AIR MODE. SET SIMULATOR TO 25°C. TURN UNIT OFF, THEN TURN UNIT ON. SET SIMULATOR TO 36°C AFTER AUTO TEST. WAIT 3 MINUTES. SET SIMULATOR TO 25°C.
TO SHEET 4
*9 TO 18 SECONDS AFTER AUTO TEST CYCLE OR AFTER SIMULATOR WAS SET TO TEMPERATURE.

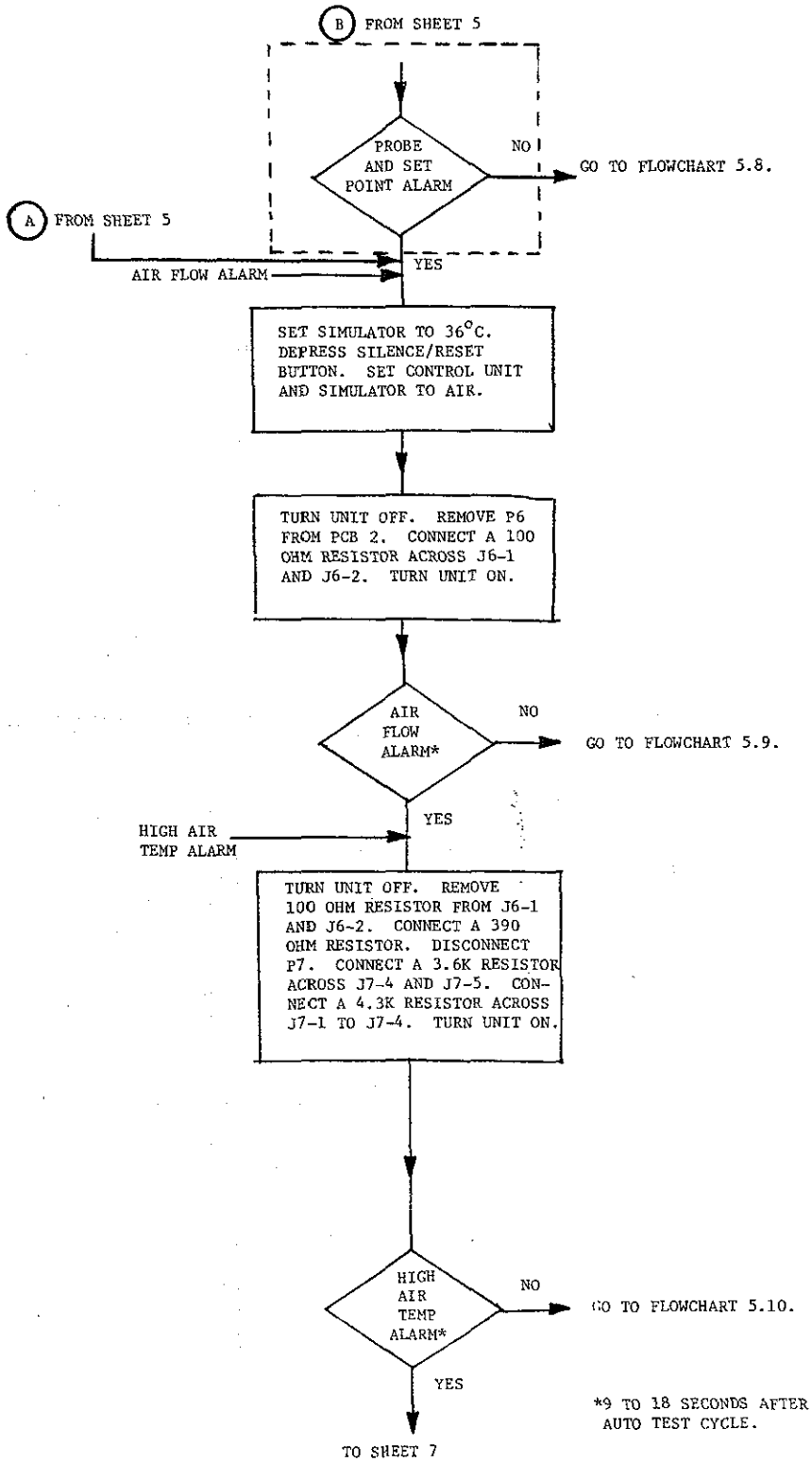
FLOWCHART 5.1 OVERALL CHECKS (SHEET 3 OF 8)



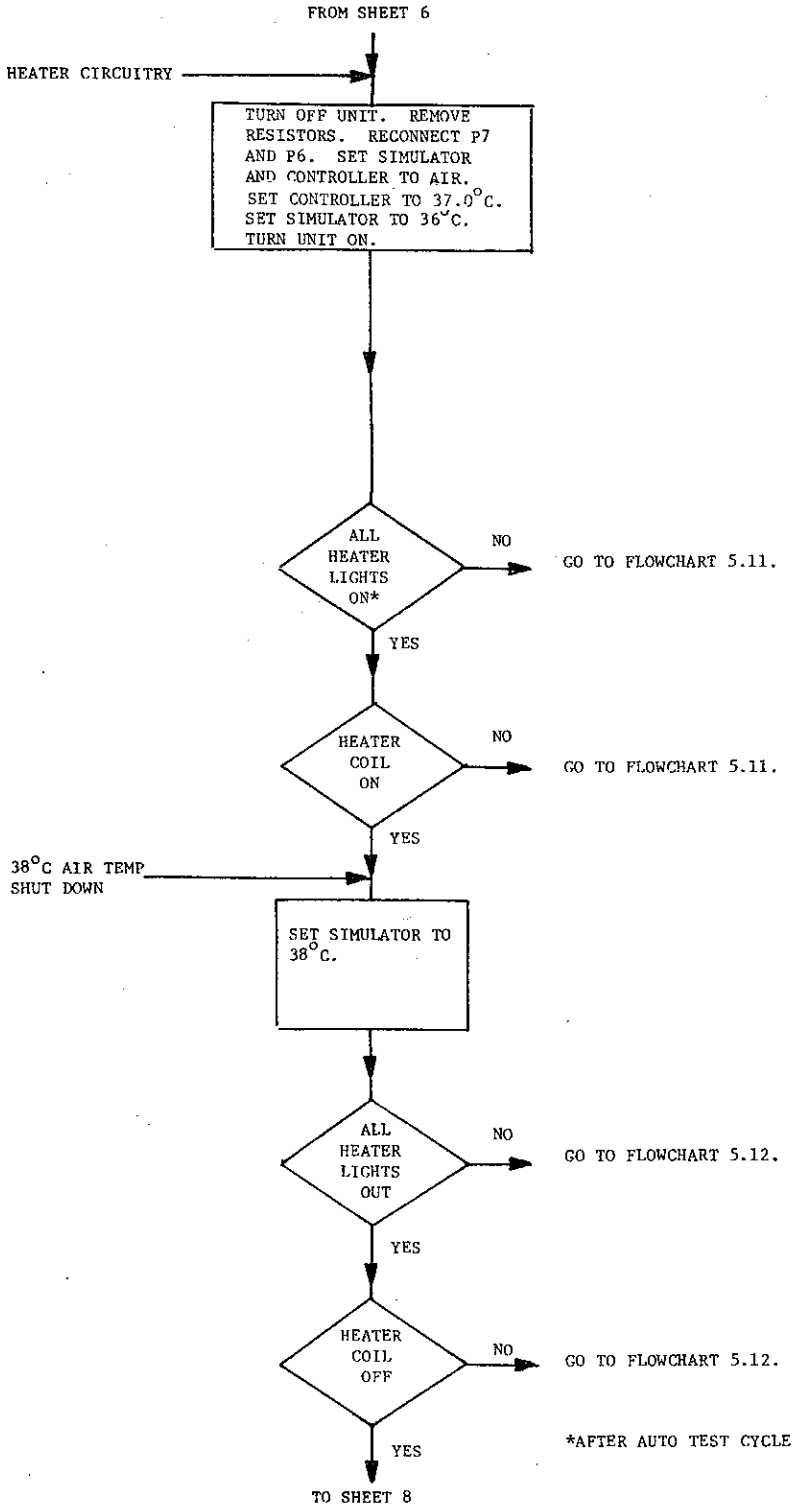
FLOWCHART 5.1 OVERALL CHECKS (SHEET 4 of 8)



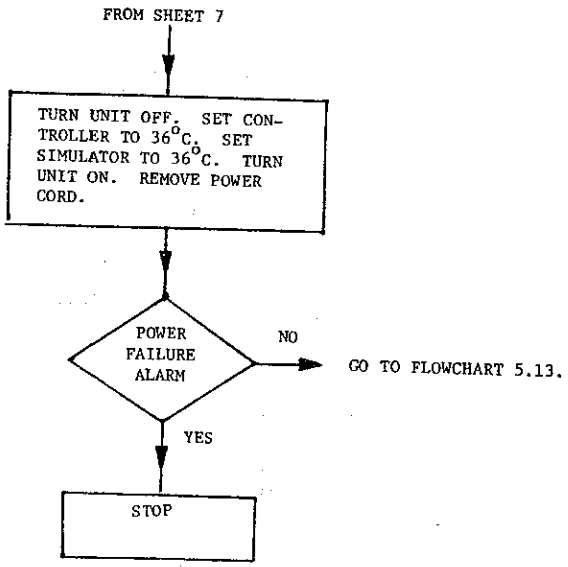
FLOWCHART 5.1 OVERALL CHECKS (SHEET 5 of 8)


B FROM SHEET 5
PROBE AND SET POINT ALARM
NO
GO TO FLOWCHART 5.8.
A FROM SHEET 5
AIR FLOW ALARM
YES
SET SIMULATOR TO 36°C. DEPRESS SILENCE/RESET BUTTON. SET CONTROL UNIT AND SIMULATOR TO AIR.
TURN UNIT OFF. REMOVE P6 FROM PCB 2. CONNECT A 100 OHM RESISTOR ACROSS J6-1 AND J6-2. TURN UNIT ON.
AIR FLOW ALARM*
NO
GO TO FLOWCHART 5.9.
YES
HIGH AIR TEMP ALARM
TURN UNIT OFF. REMOVE 100 OHM RESISTOR FROM J6-1 AND J6-2. CONNECT A 390 OHM RESISTOR. DISCONNECT P7. CONNECT A 3.6K RESISTOR ACROSS J7-4 AND J7-5. CONNECT A 4.3K RESISTOR ACROSS J7-1 TO J7-4. TURN UNIT ON.
HIGH AIR TEMP ALARM*
NO
GO TO FLOWCHART 5.10.
YES
*9 TO 18 SECONDS AFTER AUTO TEST CYCLE.
TO SHEET 7

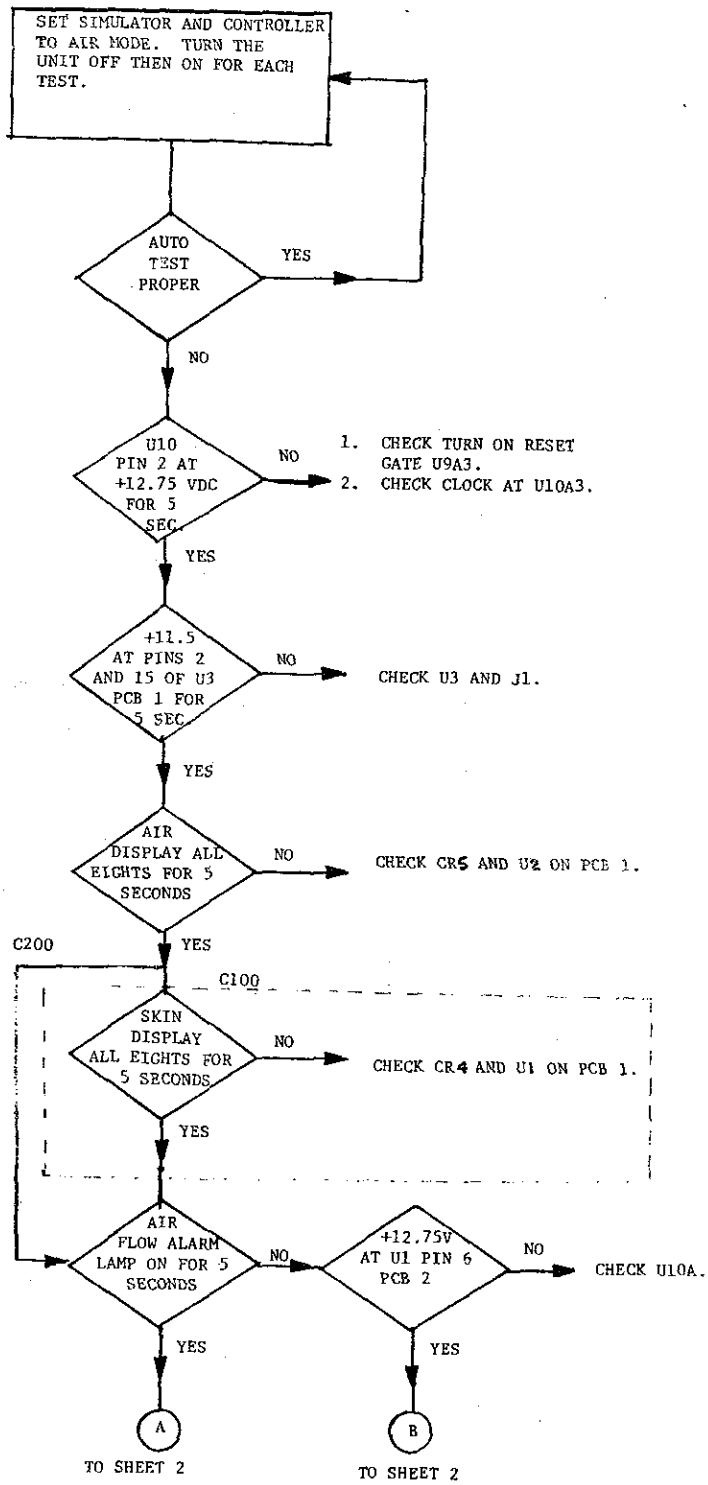
FLOWCHART 5.1 OVERALL CHECKS (SHEET 6 of 8)



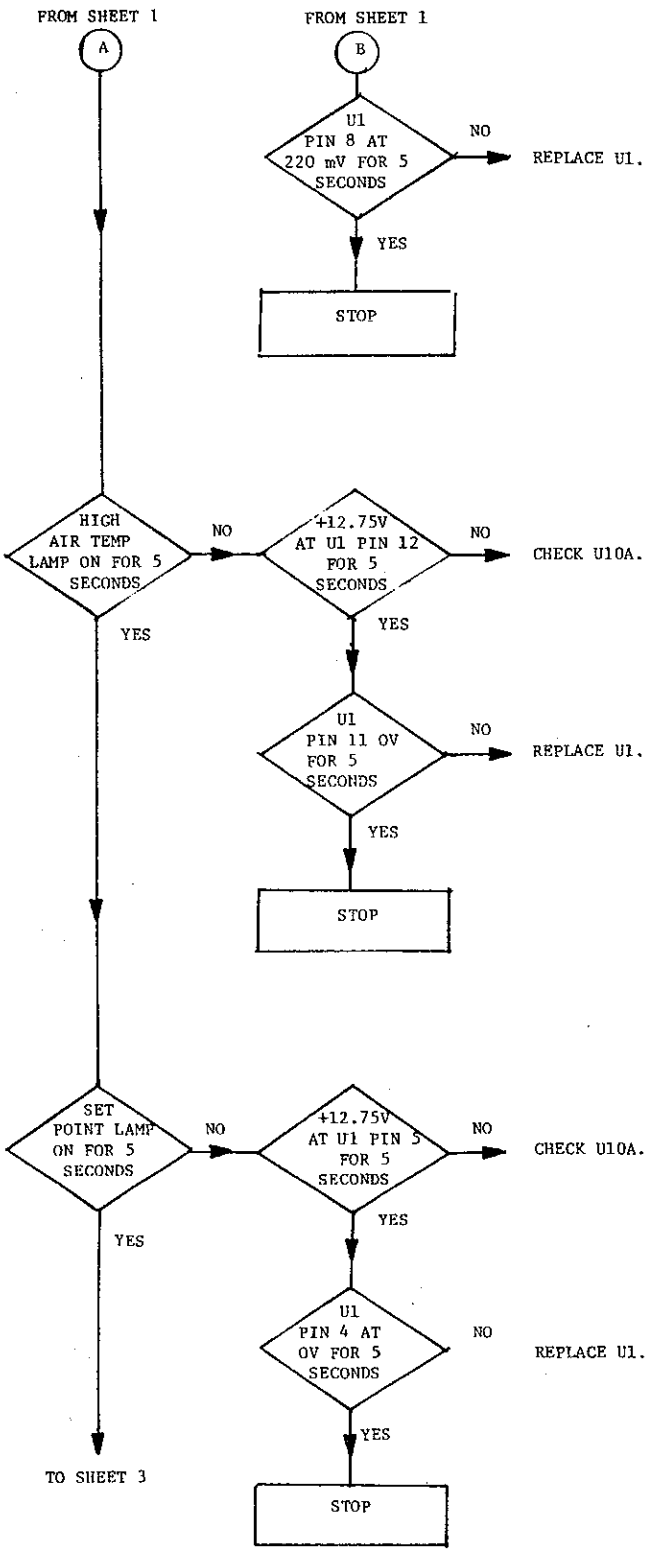
FLOWCHART 5.1 OVERALL CHECKS (SHEET 7 of 8)


FROM SHEET 7
TURN UNIT OFF. SET CONTROLLER TO 36°C. SET SIMULATOR TO 36°C. TURN UNIT ON. REMOVE POWER CORD.
POWER FAILURE ALARM
NO
GO TO FLOWCHART 5.13.
YES
STOP

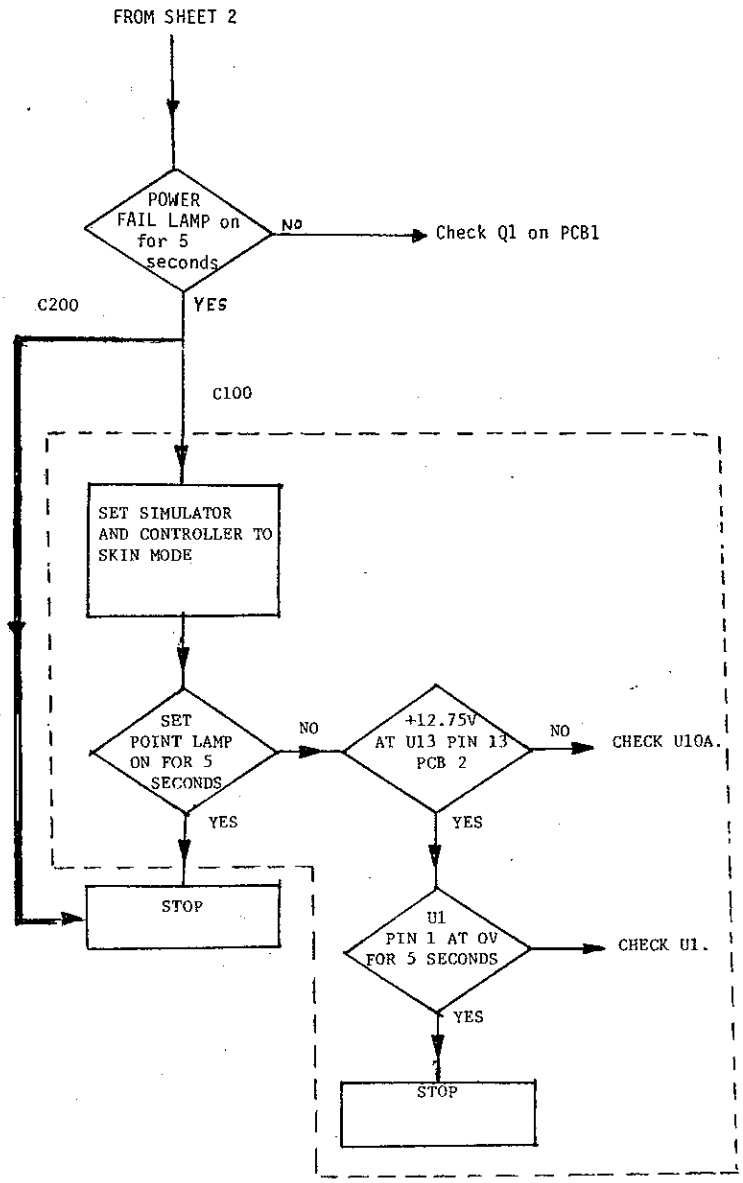
FLOWCHART 5.1 OVERALL CHECKS (SHEET 8 of 8)



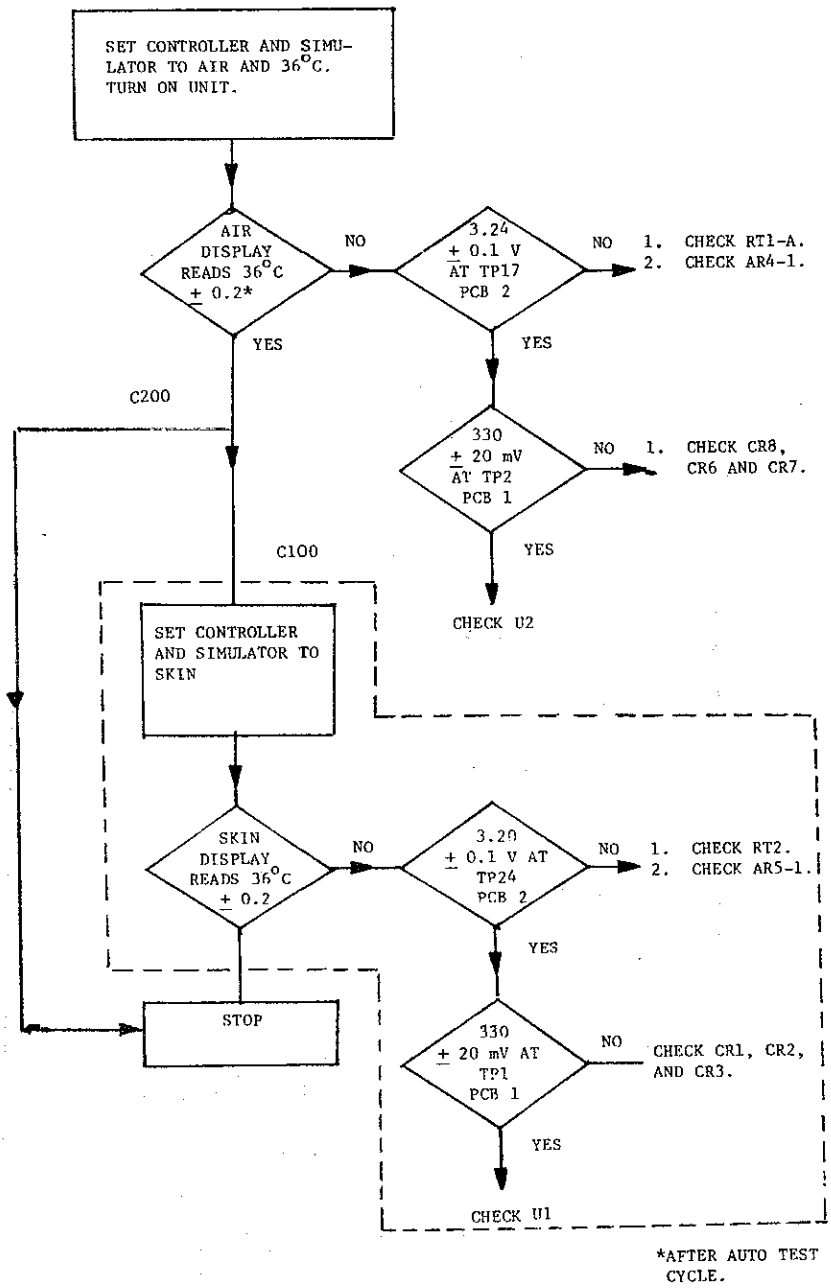
FLOWCHART 5.2 AUTO TEST TROUBLESHOOTING (SHEET 1 OF 3)



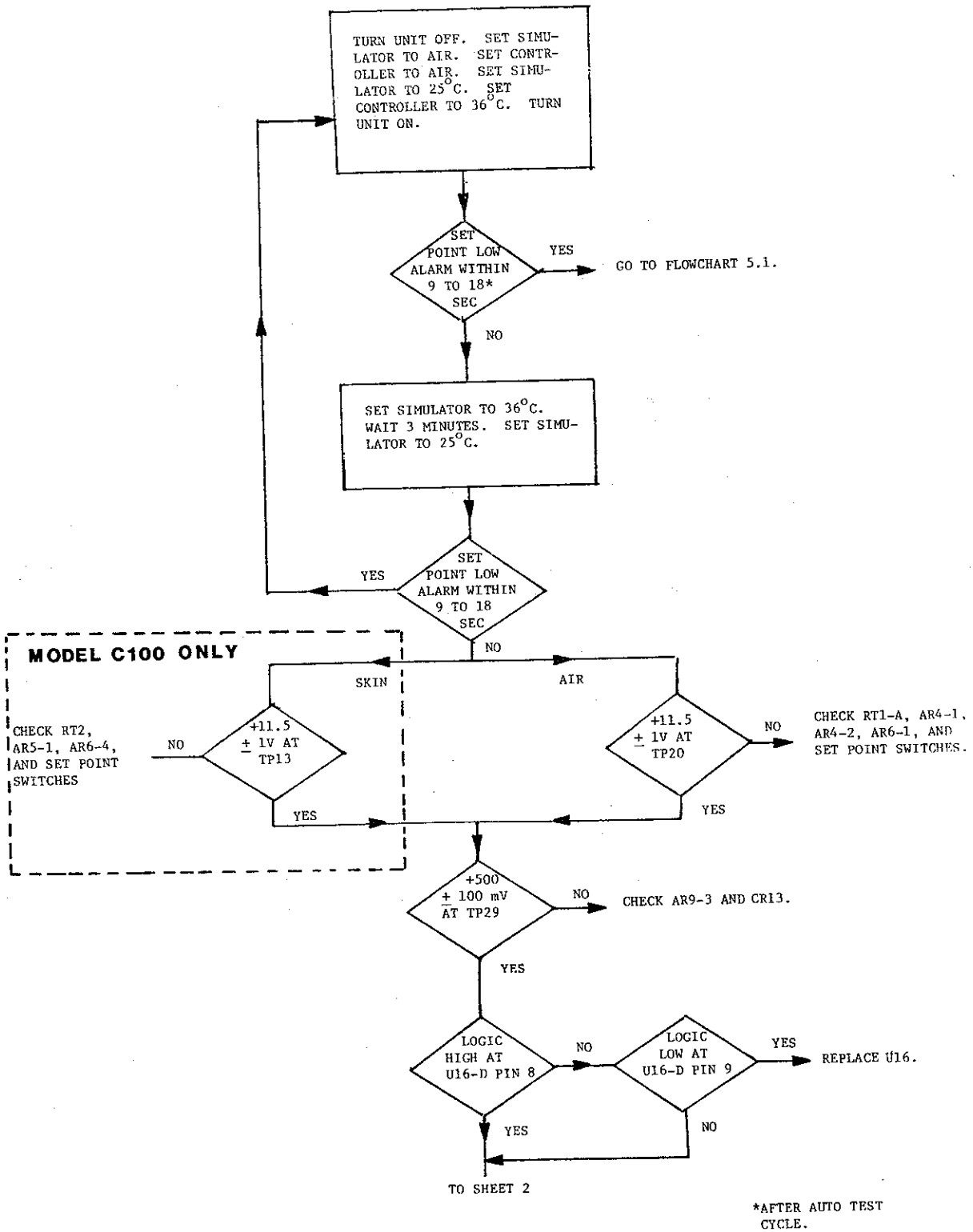
FLOWCHART 5.2 AUTO TEST TROUBLESHOOTING (SHEET 2 OF 3)



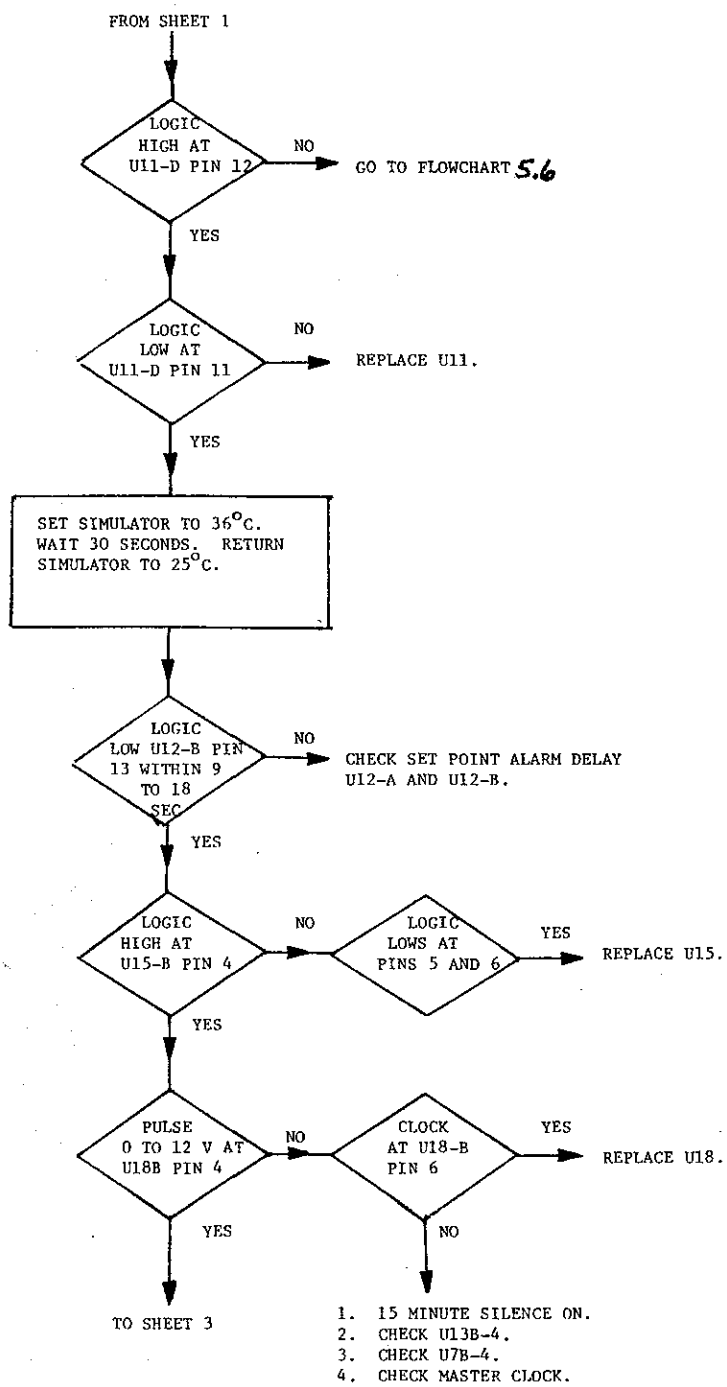
FLOWCHART 5.2 AUTO TEST TROUBLESHOOTING (SHEET 3 OF 3)



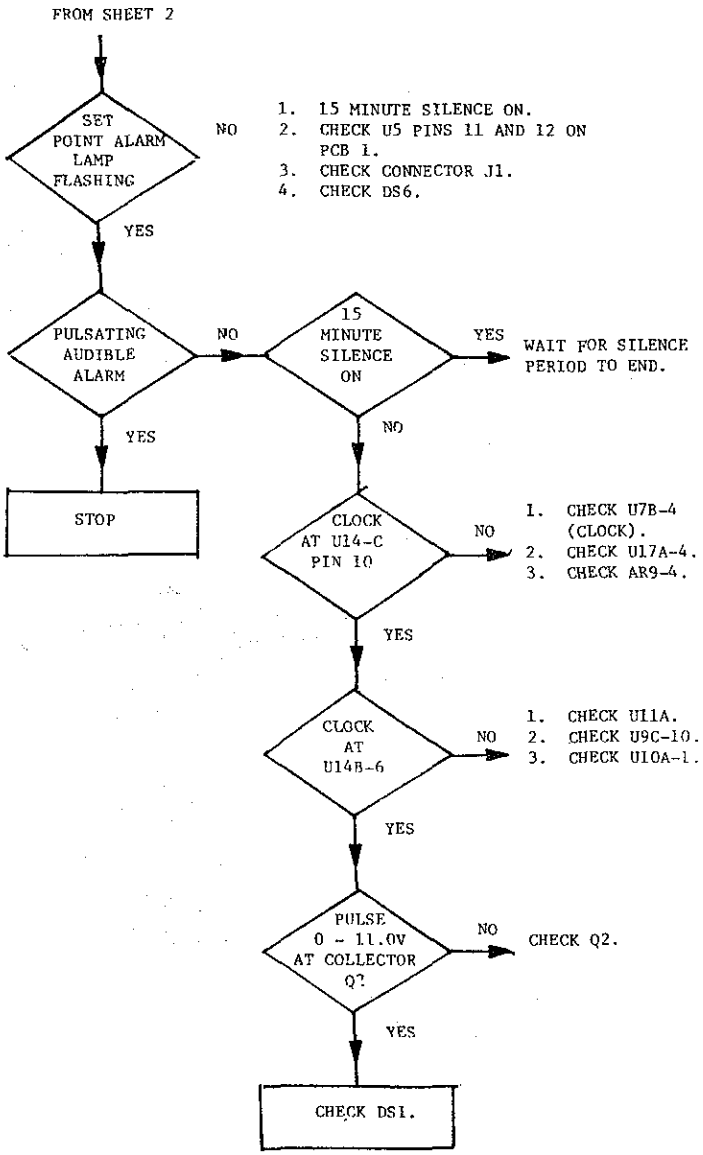
FLOWCHART 5.3 DISPLAY TROUBLESHOOTING


TURN UNIT OFF. SET SIMULATOR TO AIR. SET CONTROLLER TO AIR. SET SIMULATOR TO 25°C. SET CONTROLLER TO 36°C. TURN UNIT ON.
SET POINT LOW ALARM WITHIN 9 TO 18* SEC
YES
GO TO FLOWCHART 5.1.
NO
SET SIMULATOR TO 36°C. WAIT 3 MINUTES. SET SIMULATOR TO 25°C.
SET POINT LOW ALARM WITHIN 9 TO 18 SEC
YES
NO
MODEL C100 ONLY
SKIN
AIR
CHECK RT2, AR5-1, AR6-4, AND SET POINT SWITCHES
NO
+11.5 ± 1V AT TP13
YES
+11.5 ± 1V AT TP20
NO
CHECK RT1-A, AR4-1, AR4-2, AR6-1, AND SET POINT SWITCHES.
YES
+500 ± 100 mV AT TP29
NO
CHECK AR9-3 AND CR13.
YES
LOGIC HIGH AT U16-D PIN 8
NO
LOGIC LOW AT U16-D PIN 9
YES
REPLACE U16.
NO
YES
TO SHEET 2
*AFTER AUTO TEST CYCLE.

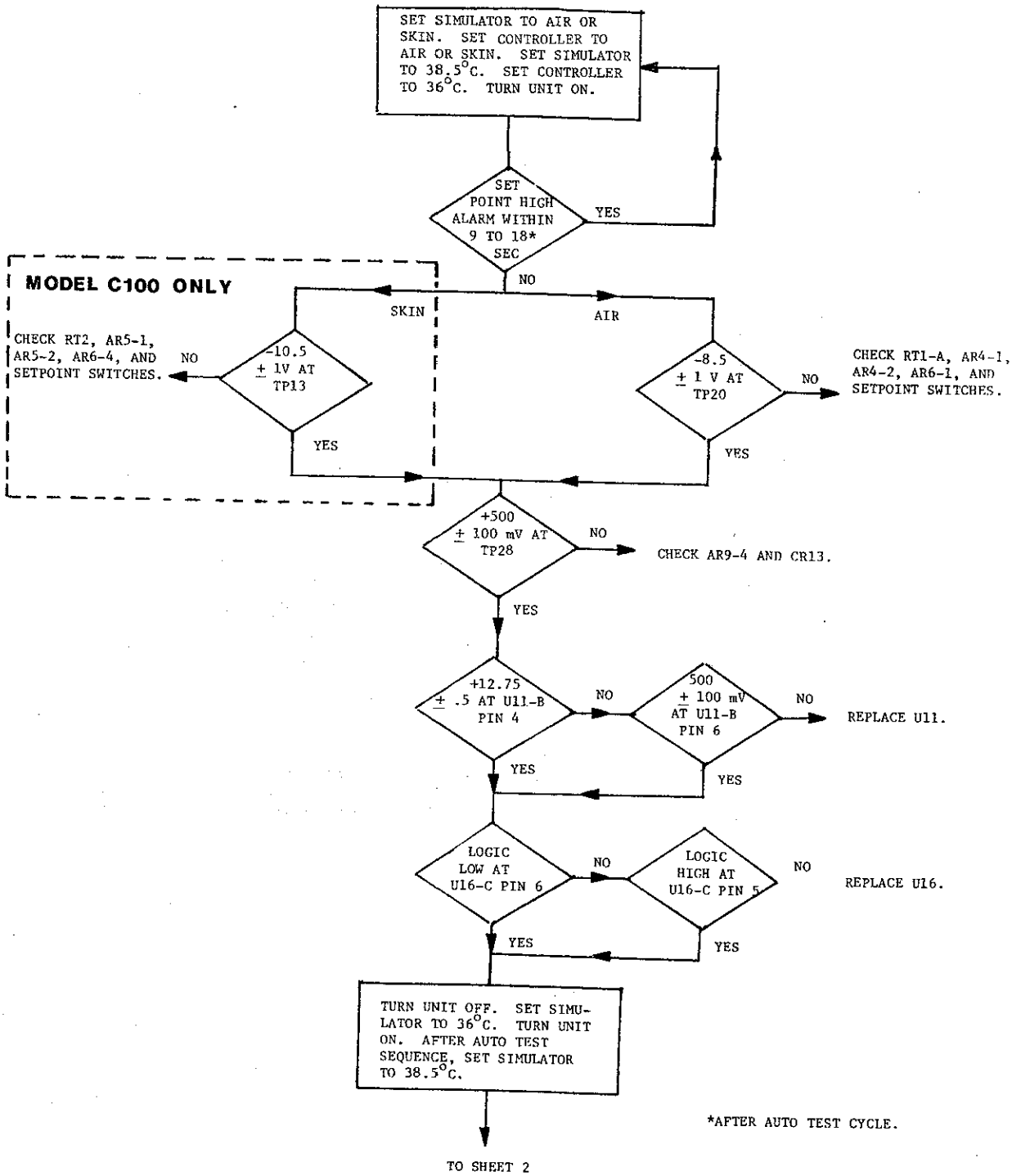
FLOWCHART 5.4 SET TEMP LOW ALARM TROUBLESHOOTING (SHEET 1 of 3)



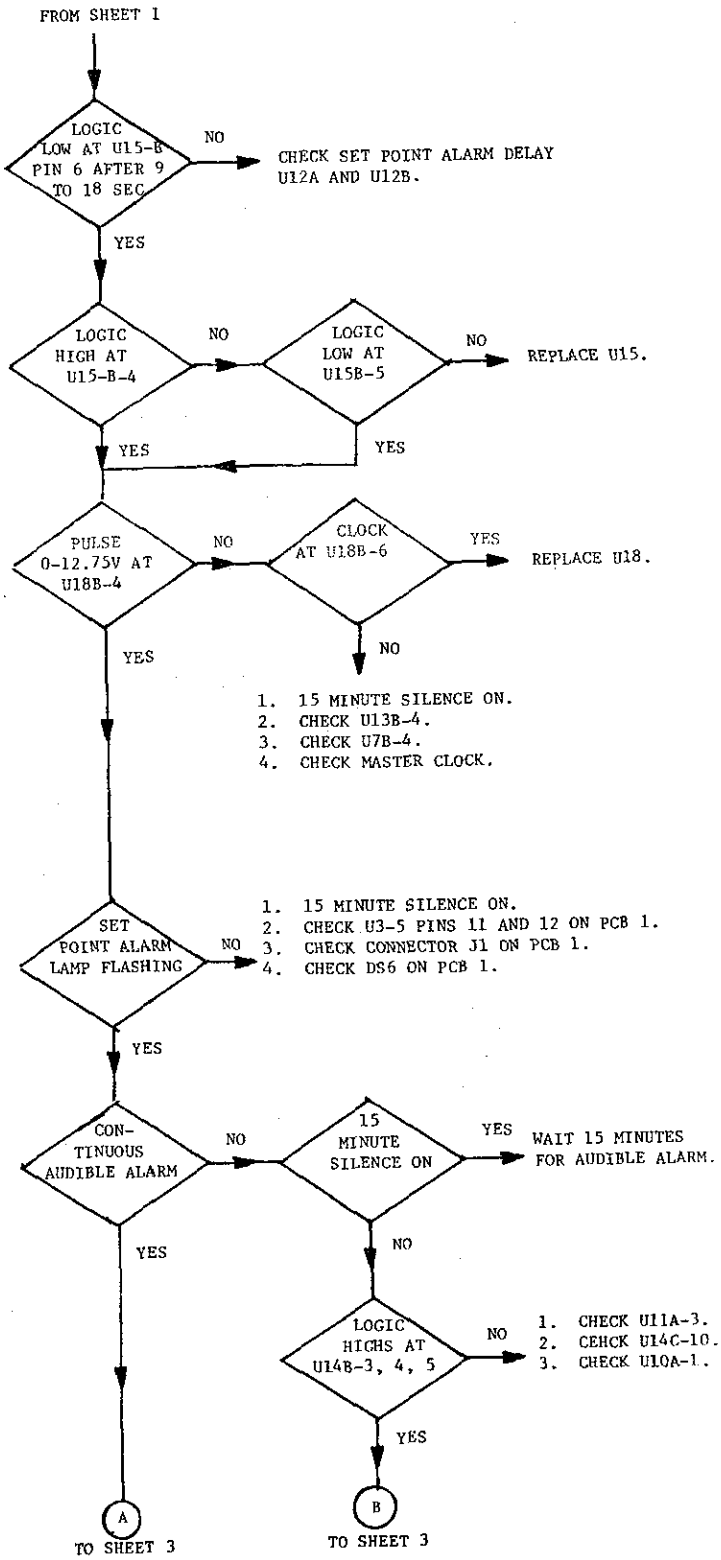
FLOWCHART 5.4 SET TEMP LOW ALARM TROUBLESHOOTING (SHEET 2 OF 3)



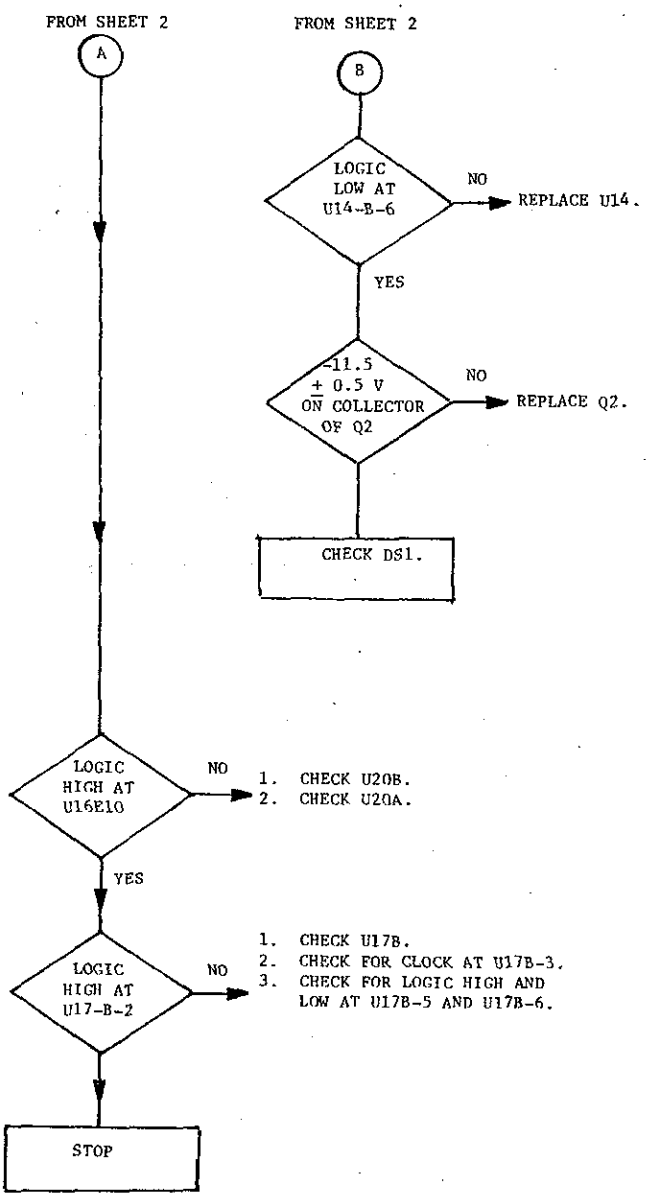
FLOWCHART 5.4 SET TEMP LOW ALARM TROUBLESHOOTING (SHEET 3 OF 3)


SET SIMULATOR TO AIR OR SKIN. SET CONTROLLER TO AIR OR SKIN. SET SIMULATOR TO 38.5°C. SET CONTROLLER TO 36°C. TURN UNIT ON.
SET POINT HIGH ALARM WITHIN 9 TO 18* SEC
YES
NO
MODEL C100 ONLY
SKIN
AIR
CHECK RT2, AR5-1, AR5-2, AR6-4, AND SETPOINT SWITCHES.
NO
-10.5 ± 1V AT TP13
YES
-8.5 ± 1 V AT TP20
NO
CHECK RT1-A, AR4-1, AR4-2, AR6-1, AND SETPOINT SWITCHES.
YES
+500 ± 100 mV AT TP28
NO
CHECK AR9-4 AND CR13.
YES
+12.75 ± .5 AT U11-B PIN 4
NO
500 ± 100 mV AT U11-B PIN 6
NO
REPLACE U11.
YES
YES
LOGIC LOW AT U16-C PIN 6
NO
LOGIC HIGH AT U16-C PIN 5
NO
REPLACE U16.
YES
YES
TURN UNIT OFF. SET SIMULATOR TO 36°C. TURN UNIT ON. AFTER AUTO TEST SEQUENCE, SET SIMULATOR TO 38.5°C.
*AFTER AUTO TEST CYCLE.
TO SHEET 2

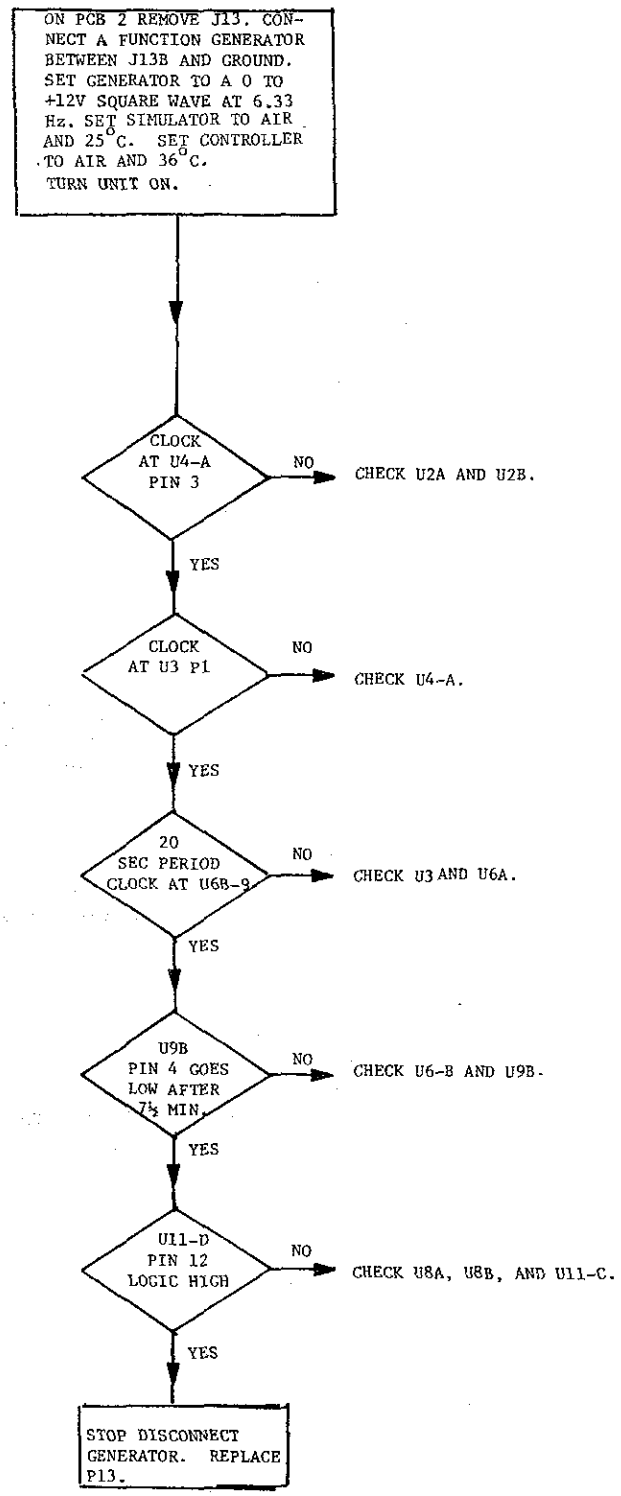
FLOWCHART 5.5 SET TEMP HIGH ALARM TROUBLESHOOTING (SHEET 1 of 3)



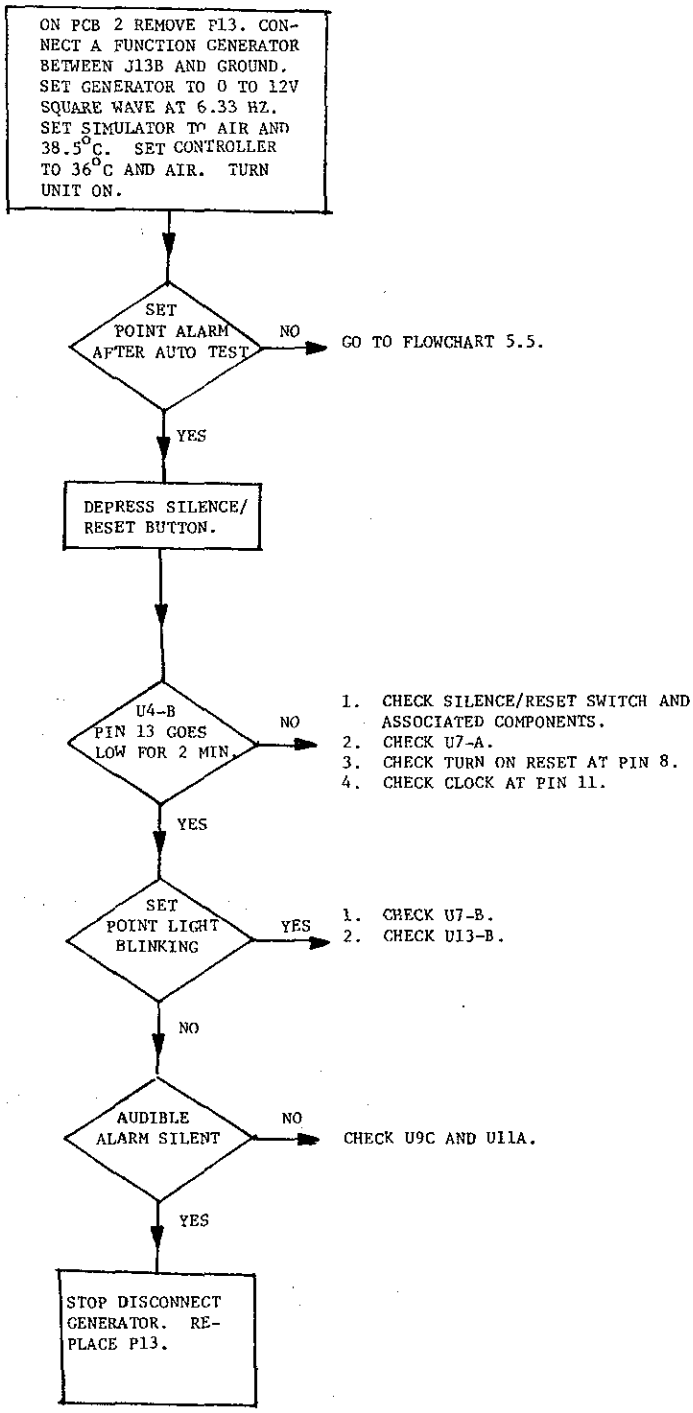
FLOWCHART 5.5 SET TEMP HIGH ALARM TROUBLESHOOTING (SHEET 2 OF 3)



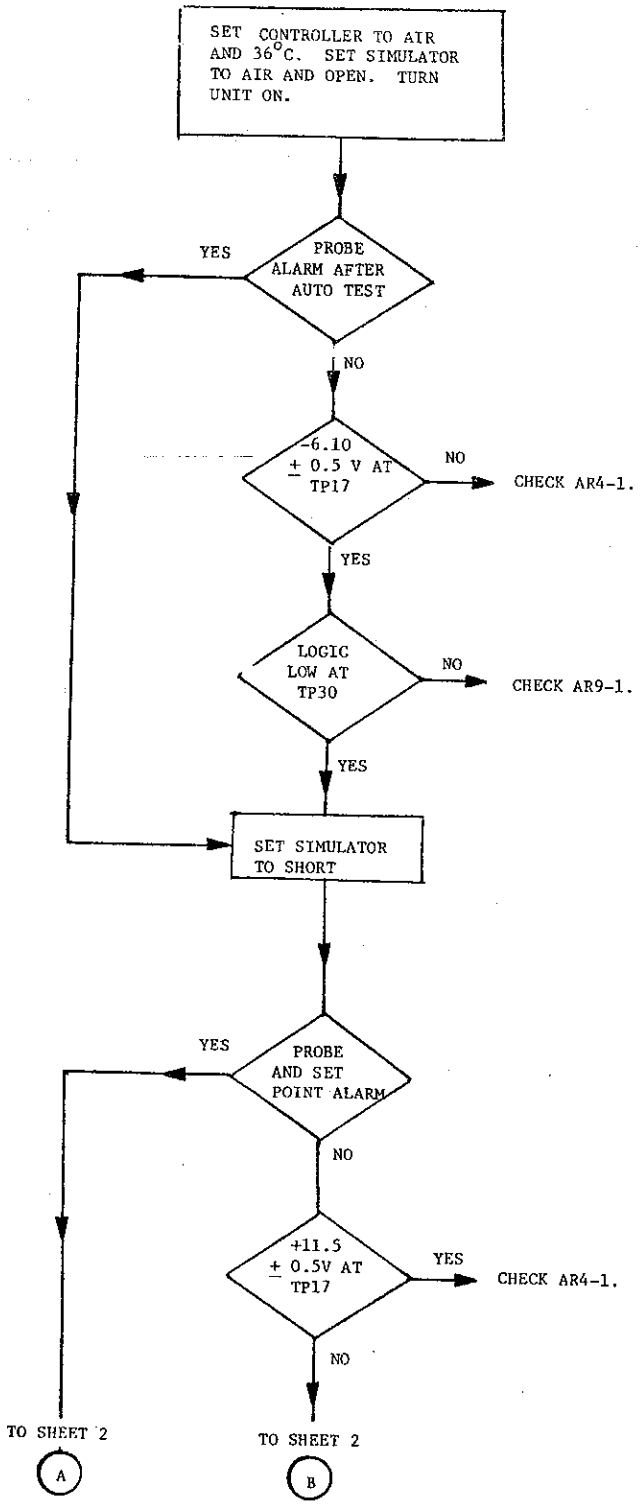
FLOWCHART 5.5 SET TEMP HIGH ALARM TROUBLESHOOTING (SHEET 3 OF 3)


ON PCB 2 REMOVE J13. CONNECT A FUNCTION GENERATOR BETWEEN J13B AND GROUND. SET GENERATOR TO A 0 TO +12V SQUARE WAVE AT 6.33 Hz. SET SIMULATOR TO AIR AND 25°C. SET CONTROLLER TO AIR AND 36°C. TURN UNIT ON.
CLOCK AT U4-A PIN 3
NO
CHECK U2A AND U2B.
YES
CLOCK AT U3 P1
NO
CHECK U4-A.
YES
20 SEC PERIOD CLOCK AT U6B-9
NO
CHECK U3 AND U6A.
YES
U9B PIN 4 GOES LOW AFTER 7½ MIN.
NO
CHECK U6-B AND U9B.
YES
U11-D PIN 12 LOGIC HIGH
NO
CHECK U8A, U8B, AND U11-C.
YES
STOP DISCONNECT GENERATOR. REPLACE P13.

FLOWCHART 5.6 ONE HOUR TIMER TROUBLESHOOTING

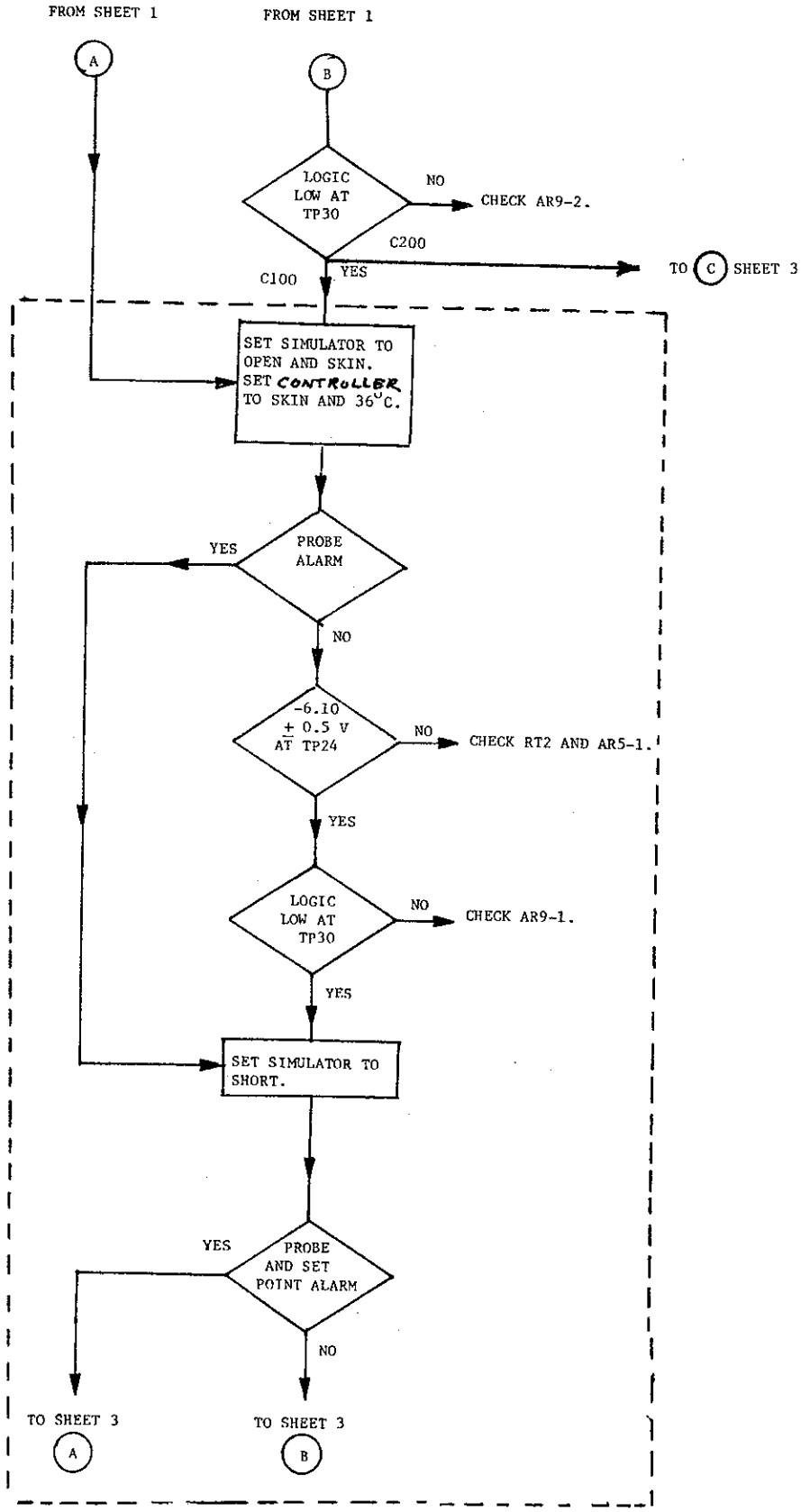

ON PCB 2 REMOVE P13. CONNECT A FUNCTION GENERATOR BETWEEN J13B AND GROUND. SET GENERATOR TO 0 TO 12V SQUARE WAVE AT 6.33 HZ. SET SIMULATOR TO AIR AND 38.5°C. SET CONTROLLER TO 36°C AND AIR. TURN UNIT ON.
SET POINT ALARM AFTER AUTO TEST
NO
GO TO FLOWCHART 5.5.
YES
DEPRESS SILENCE/ RESET BUTTON.
U4-B PIN 13 GOES LOW FOR 2 MIN.
NO
1. CHECK SILENCE/RESET SWITCH AND ASSOCIATED COMPONENTS.
2. CHECK U7-A.
3. CHECK TURN ON RESET AT PIN 8.
4. CHECK CLOCK AT PIN 11.
YES
SET POINT LIGHT BLINKING
YES
1. CHECK U7-B.
2. CHECK U13-B.
NO
AUDIBLE ALARM SILENT
NO
CHECK U9C AND U11A.
YES
STOP DISCONNECT GENERATOR. REPLACE P13.

FLOWCHART 5.7 15 MINUTE TIMER TROUBLESHOOTING



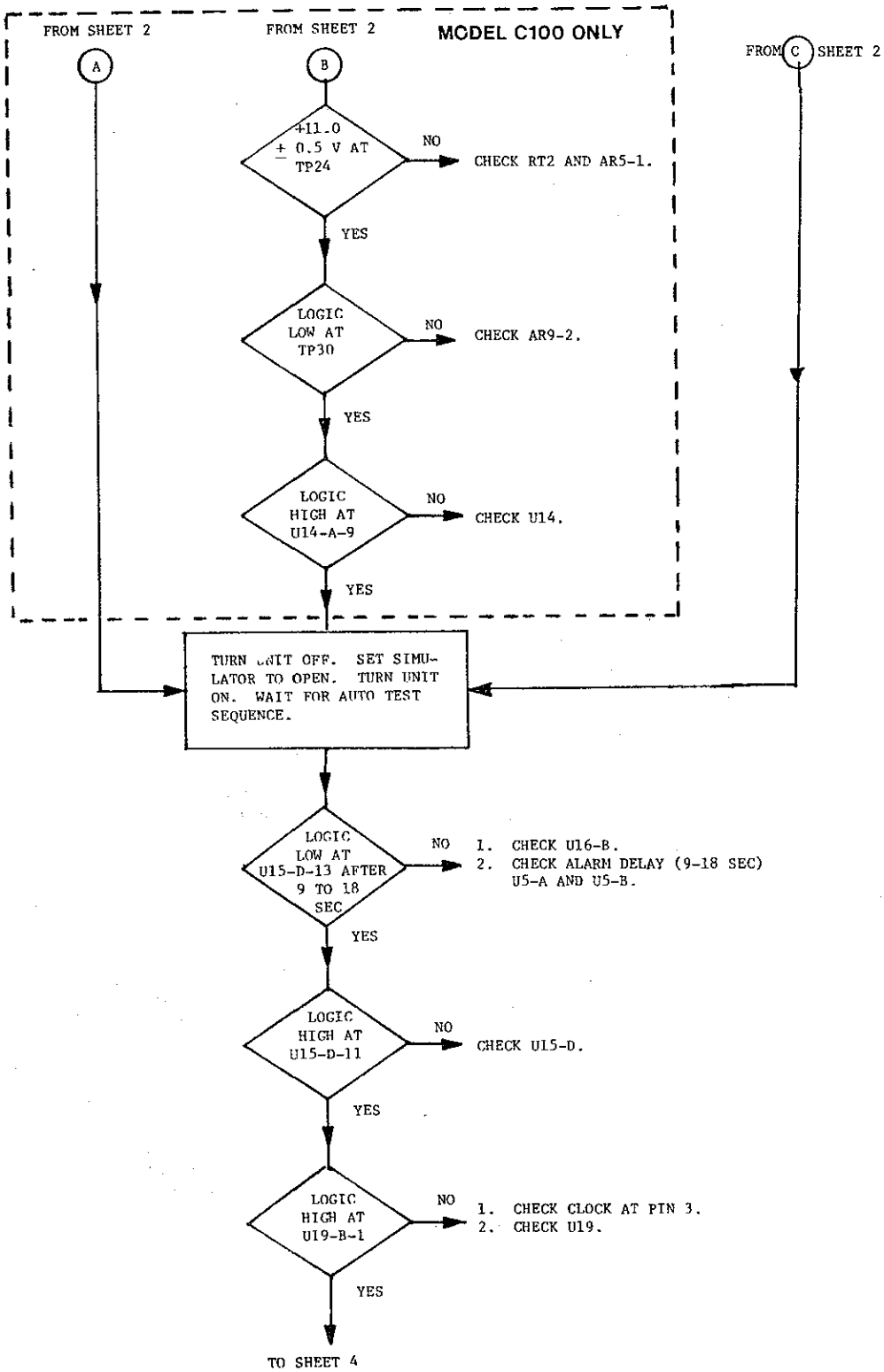
FLOWCHART 5.8 AIR AND SKIN* PROBE ALARMS TROUBLESHOOTING (SHEET 1 OF 5)

* Model C100 Only.



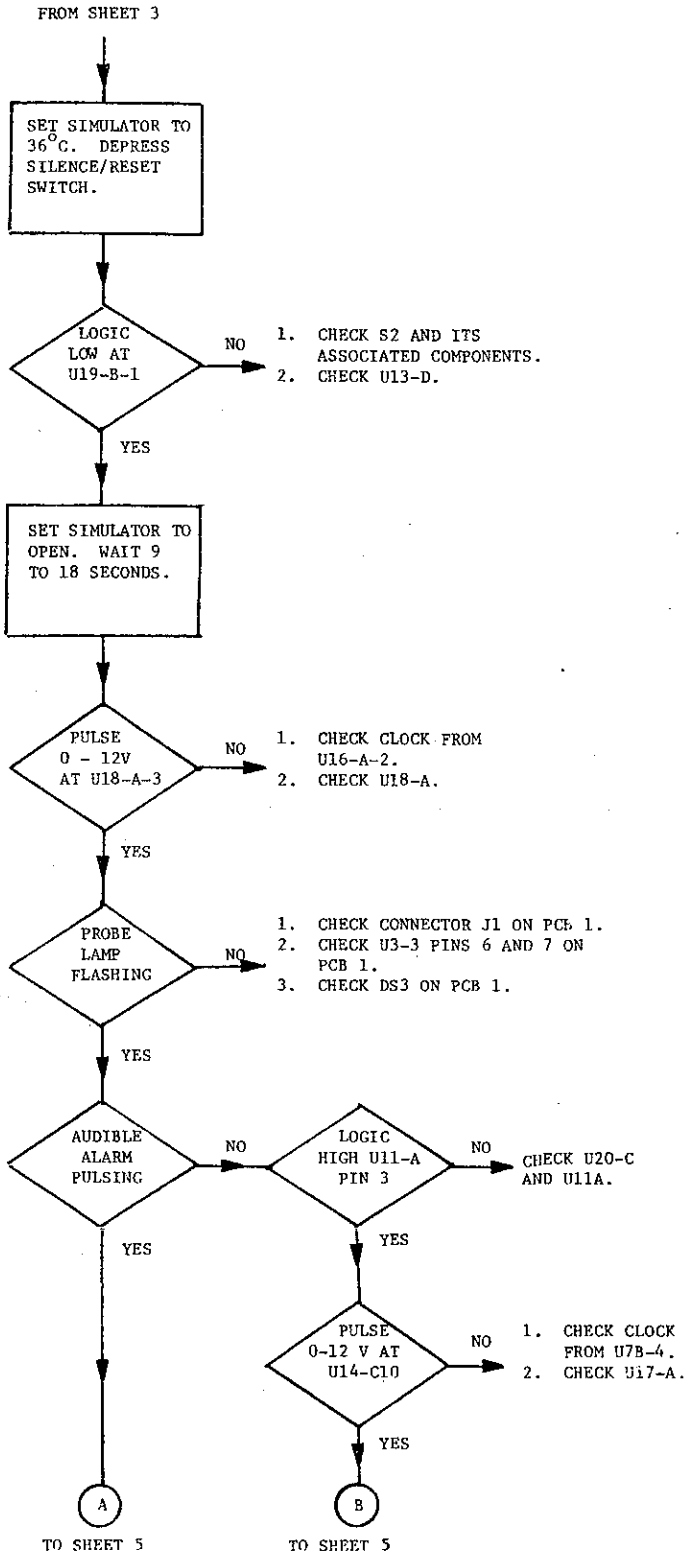
FLOWCHART 5.8 AIR AND SKIN* PROBE ALARMS TROUBLESHOOTING (SHEET 2 of 5)

*Model C100 Only.



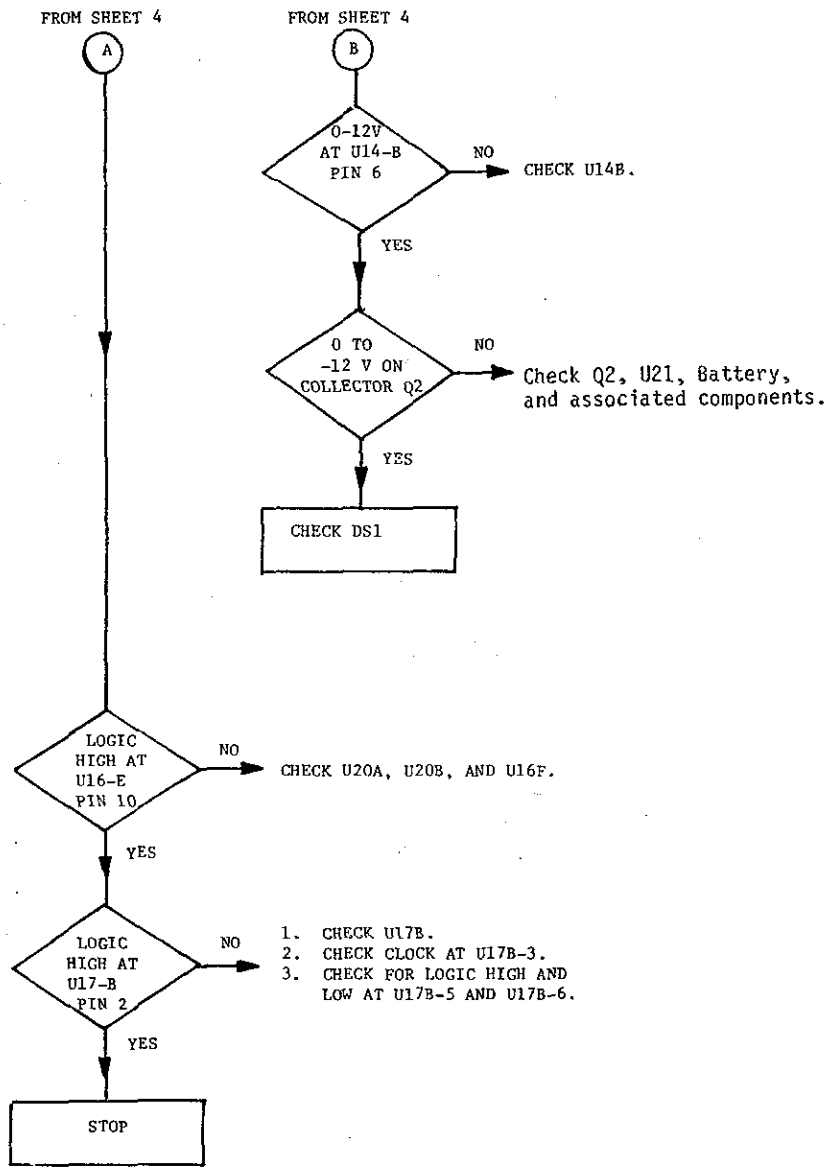
FLOWCHART 5.8 AIR AND SKIN* PROBE ALARMS TROUBLESHOOTING (SHEET 3 of 5)

* Model C100 Only.



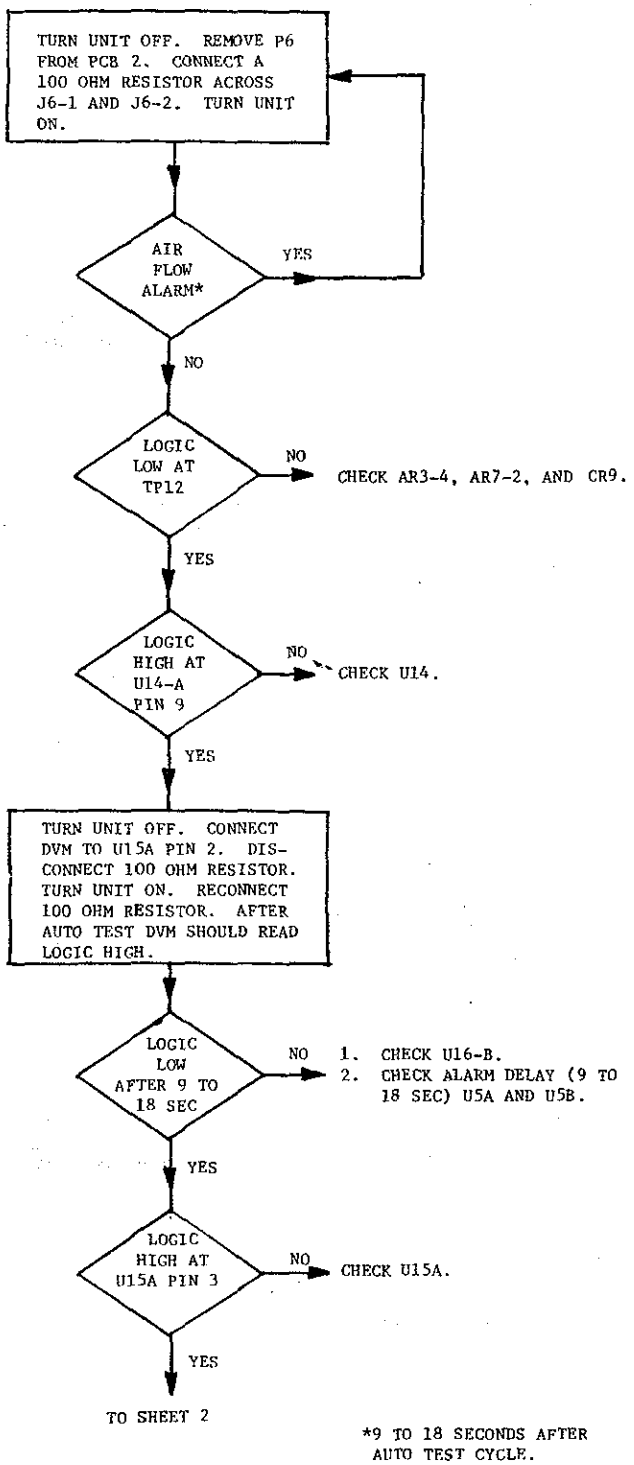
FLOWCHART 5.8 AIR AND SKIN* PROBE ALARMS TROUBLESHOOTING (SHEET 4 OF 5)

* Model C100 Only.

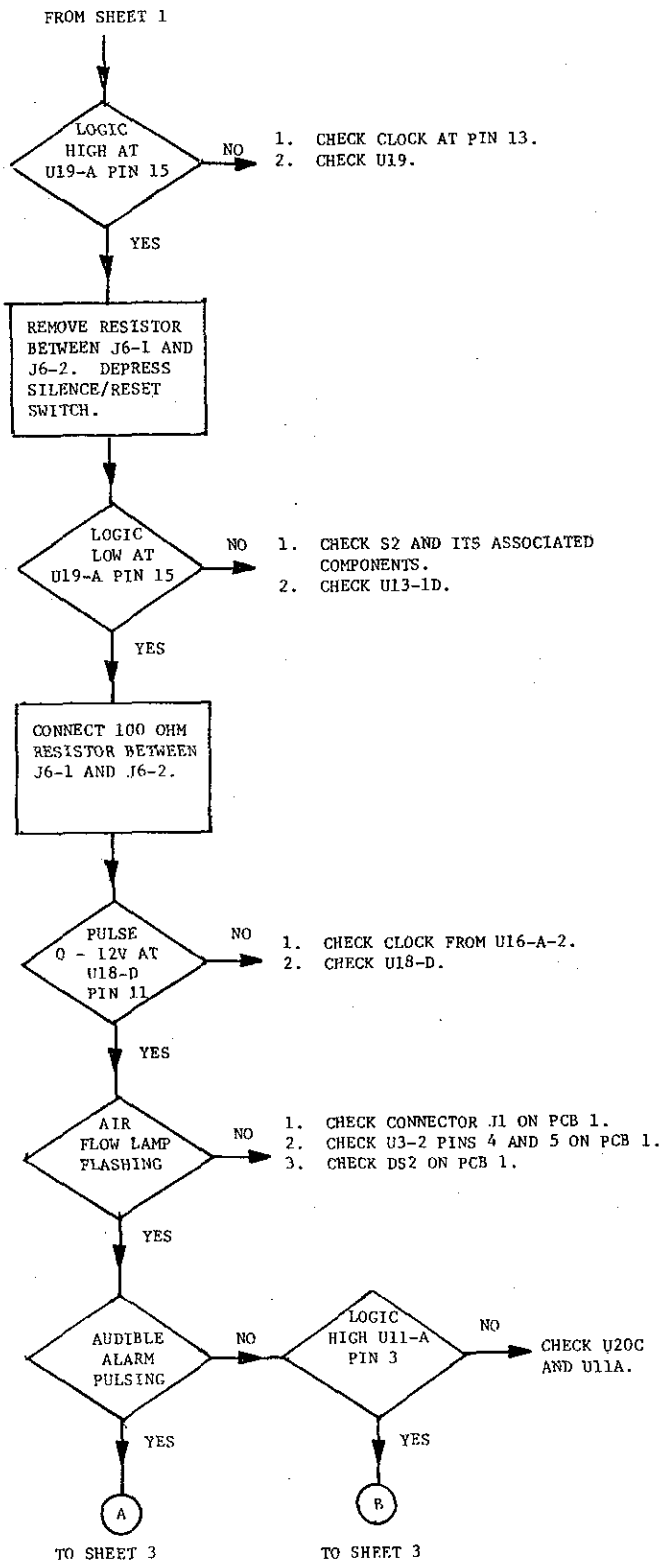


FLOWCHART 5.8 AIR AND SKIN* PROBE ALARMS TROUBLESHOOTING (SHEET 5 OF 5)

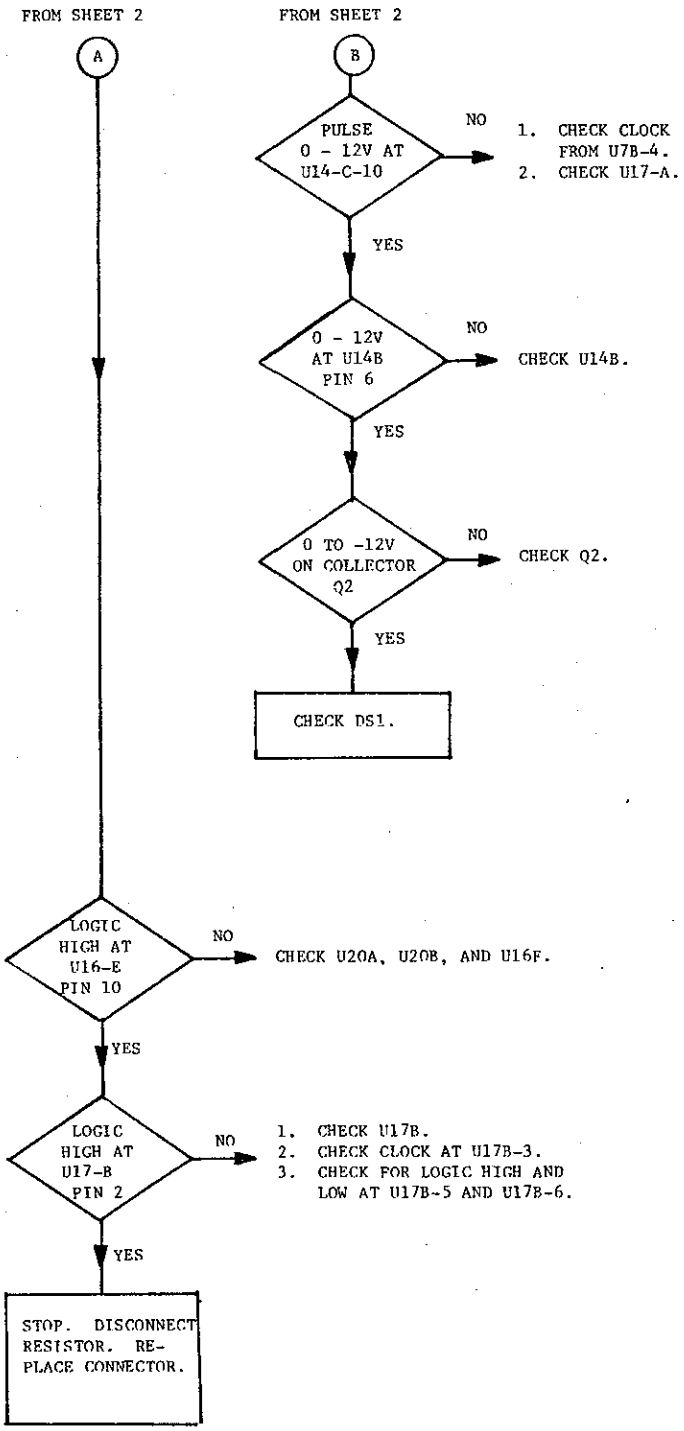
* Model C100 Only.


TURN UNIT OFF. REMOVE P6 FROM PCB 2. CONNECT A 100 OHM RESISTOR ACROSS J6-1 AND J6-2. TURN UNIT ON.
AIR FLOW ALARM*
YES
NO
LOGIC LOW AT TP12
NO
CHECK AR3-4, AR7-2, AND CR9.
YES
LOGIC HIGH AT U14-A PIN 9
NO
CHECK U14.
YES
TURN UNIT OFF. CONNECT DVM TO U15A PIN 2. DISCONNECT 100 OHM RESISTOR. TURN UNIT ON. RECONNECT 100 OHM RESISTOR. AFTER AUTO TEST DVM SHOULD READ LOGIC HIGH.
LOGIC LOW AFTER 9 TO 18 SEC
NO
1. CHECK U16-B.
2. CHECK ALARM DELAY (9 TO 18 SEC) U5A AND U5B.
YES
LOGIC HIGH AT U15A PIN 3
NO
CHECK U15A.
YES
TO SHEET 2
*9 TO 18 SECONDS AFTER AUTO TEST CYCLE.

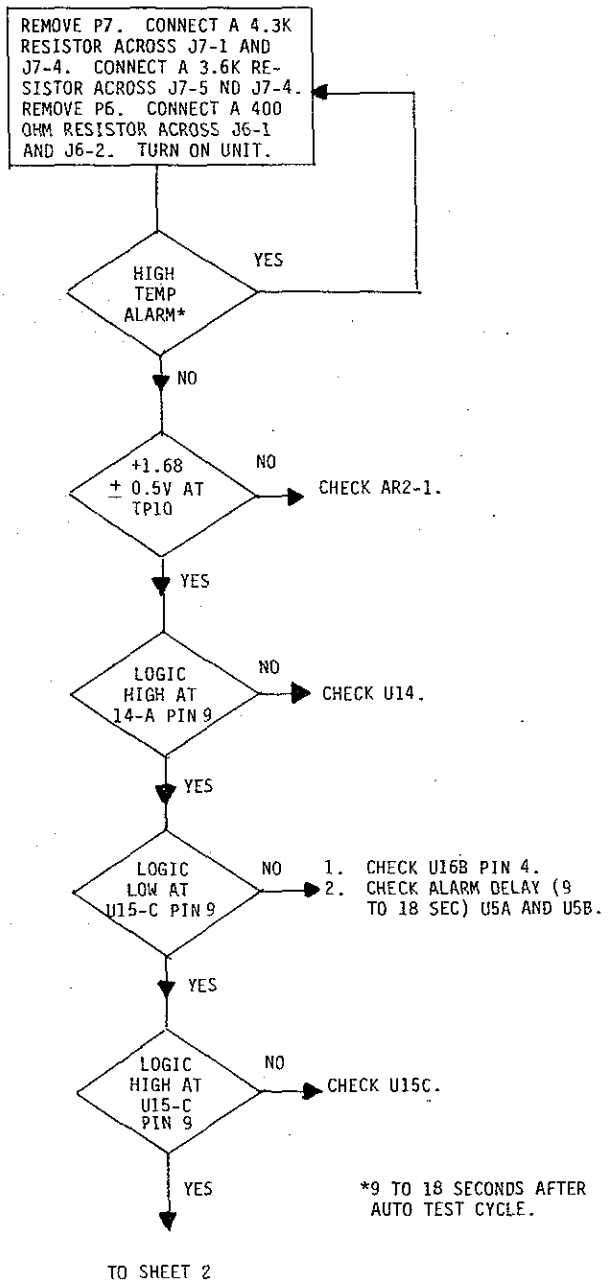
FLOWCHART 5.9 AIR FLOW ALARM TROUBLESHOOTING (SHEET 1 of 3)



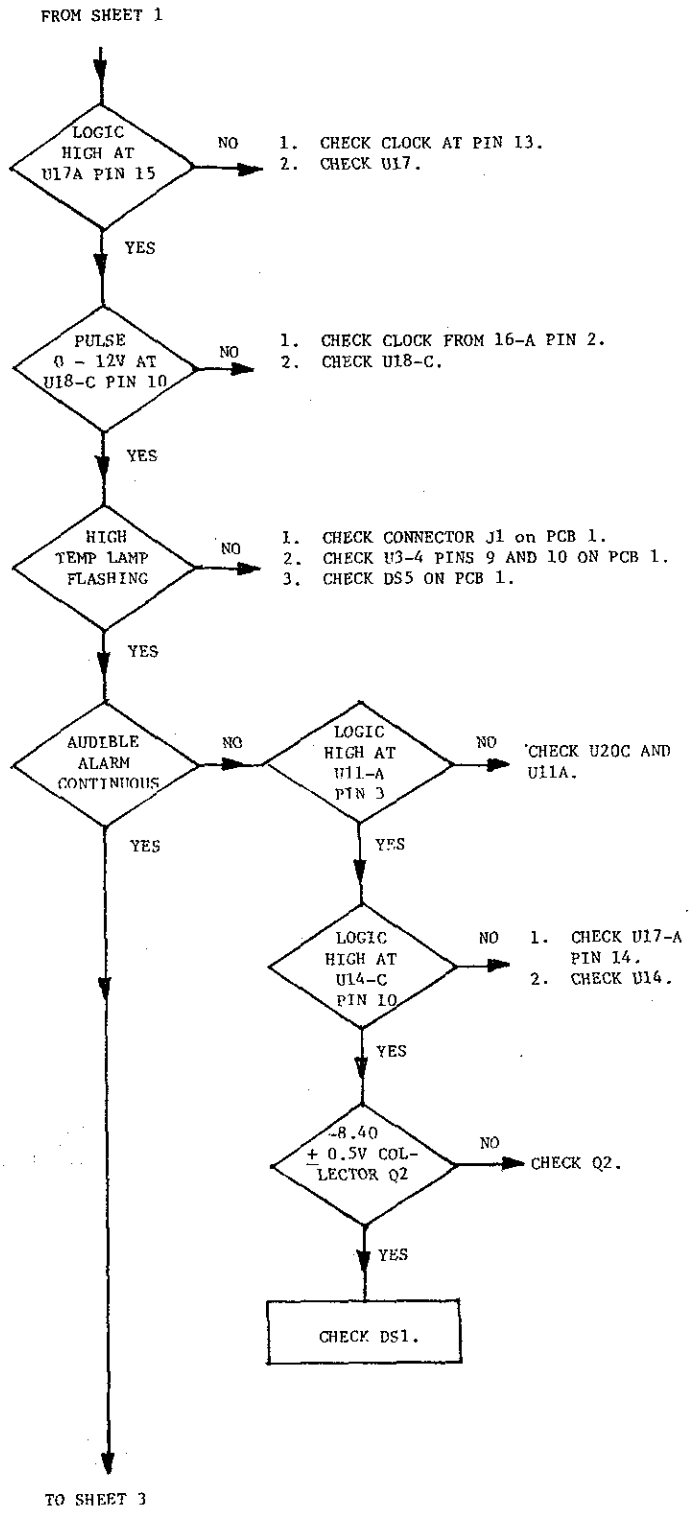
FLOWCHART 5.9 AIR FLOW ALARM TROUBLESHOOTING (SHEET 2 OF 3)



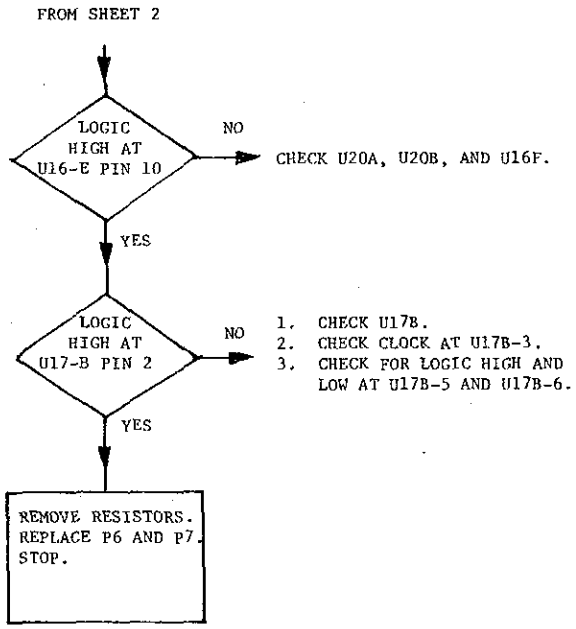
FLOWCHART 5.9 AIR FLOW ALARM TROUBLESHOOTING (SHEET 3 OF 3)


REMOVE P7. CONNECT A 4.3K RESISTOR ACROSS J7-1 AND J7-4. CONNECT A 3.6K RESISTOR ACROSS J7-5 ND J7-4. REMOVE P6. CONNECT A 400 OHM RESISTOR ACROSS J6-1 AND J6-2. TURN ON UNIT.
HIGH TEMP ALARM*
YES
NO
+1.68 ± 0.5V AT TP10
NO
CHECK AR2-1.
YES
LOGIC HIGH AT 14-A PIN 9
NO
CHECK U14.
YES
LOGIC LOW AT U15-C PIN 9
NO
1. CHECK U16B PIN 4.
2. CHECK ALARM DELAY (9 TO 18 SEC) U5A AND U5B.
YES
LOGIC HIGH AT U15-C PIN 9
NO
CHECK U15C.
YES
*9 TO 18 SECONDS AFTER AUTO TEST CYCLE.
TO SHEET 2

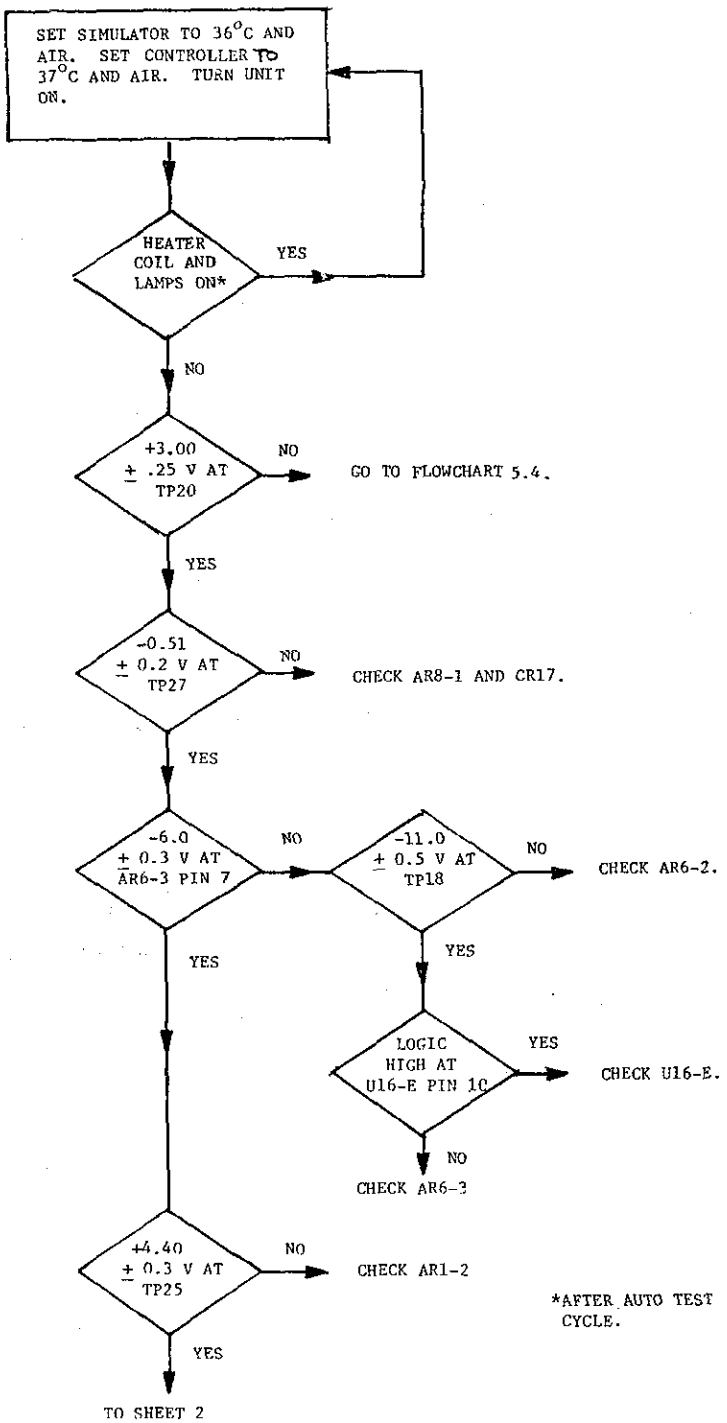
FLOWCHART 5.10 HIGH AIR TEMP ALARM TROUBLESHOOTING (SHEET 1 OF 3)



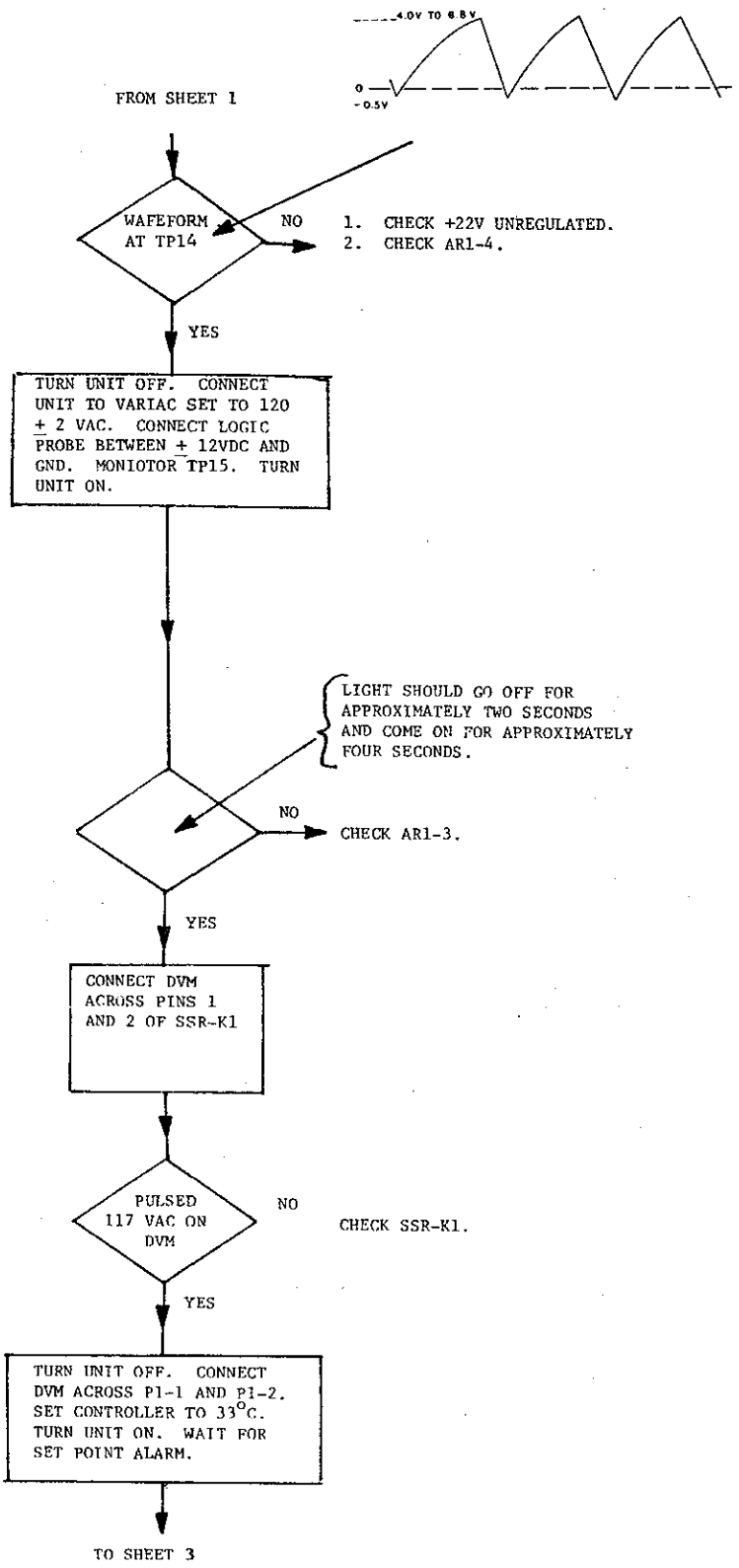
FLOWCHART 5.10 HIGH AIR TEMP ALARM TROUBLESHOOTING (SHEET 2 OF 3)



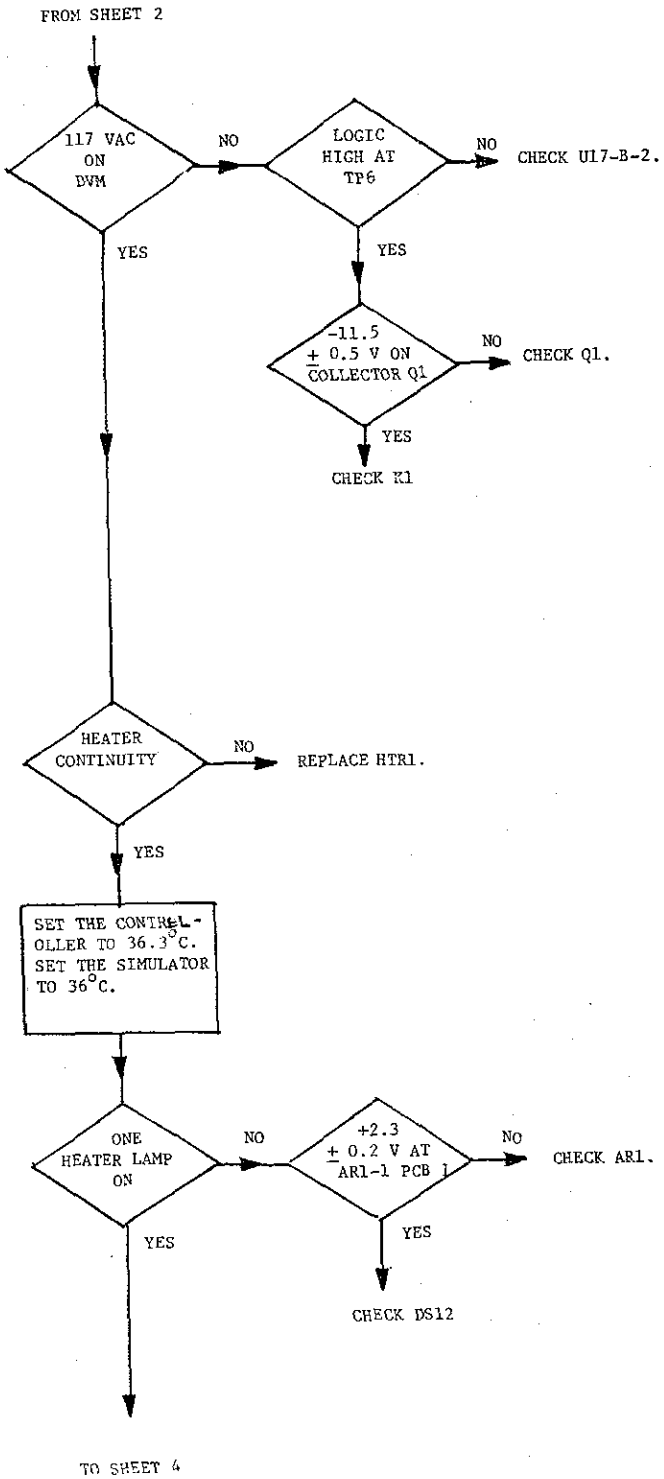
FLOWCHART 5.10 HIGH AIR TEMP ALARM TROUBLESHOOTING (SHEET 3 of 3)



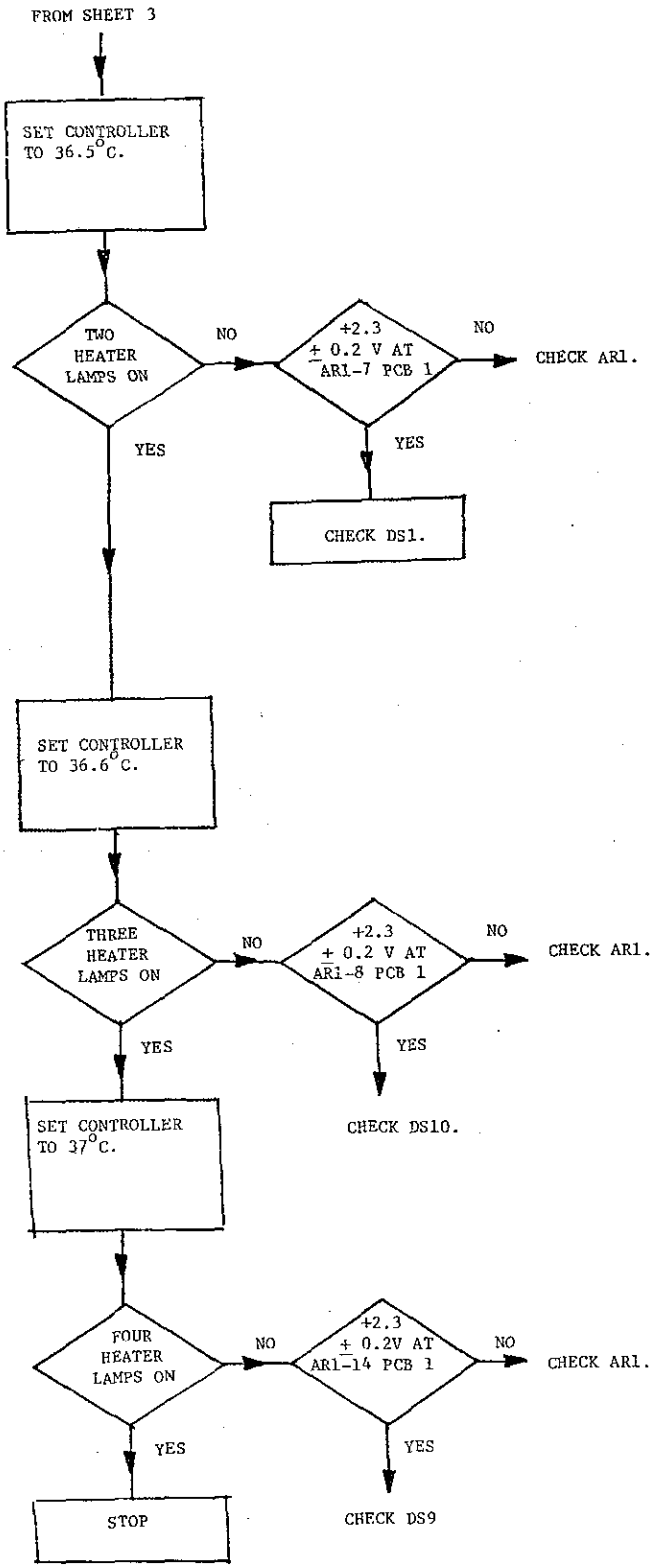
FLOWCHART 5.11 HEATER CIRCUITRY TROUBLESHOOTING (SHEET 1 OF 4)


4.0V TO 6.8V
0
-0.5V
FROM SHEET 1
WAFEFORM AT TP14
NO
1. CHECK +22V UNREGULATED.
2. CHECK AR1-4.
YES
TURN UNIT OFF. CONNECT UNIT TO VARIAC SET TO 120 ± 2 VAC. CONNECT LOGIC PROBE BETWEEN + 12VDC AND GND. MONIOTOR TP15. TURN UNIT ON.
LIGHT SHOULD GO OFF FOR APPROXIMATELY TWO SECONDS AND COME ON FOR APPROXIMATELY FOUR SECONDS.
NO
CHECK AR1-3.
YES
CONNECT DVM ACROSS PINS 1 AND 2 OF SSR-K1
PULSED 117 VAC ON DVM
NO
CHECK SSR-K1.
YES
TURN UNIT OFF. CONNECT DVM ACROSS P1-1 AND P1-2. SET CONTROLLER TO 33°C. TURN UNIT ON. WAIT FOR SET POINT ALARM.
TO SHEET 3

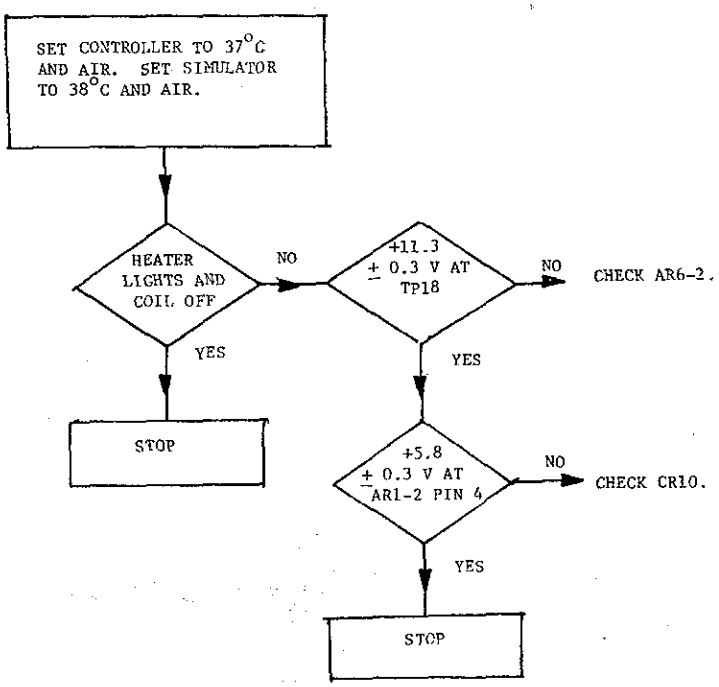
FLOWCHART 5.11 HEATER CIRCUITRY TROUBLESHOOTING (SHEET 2 of 4)



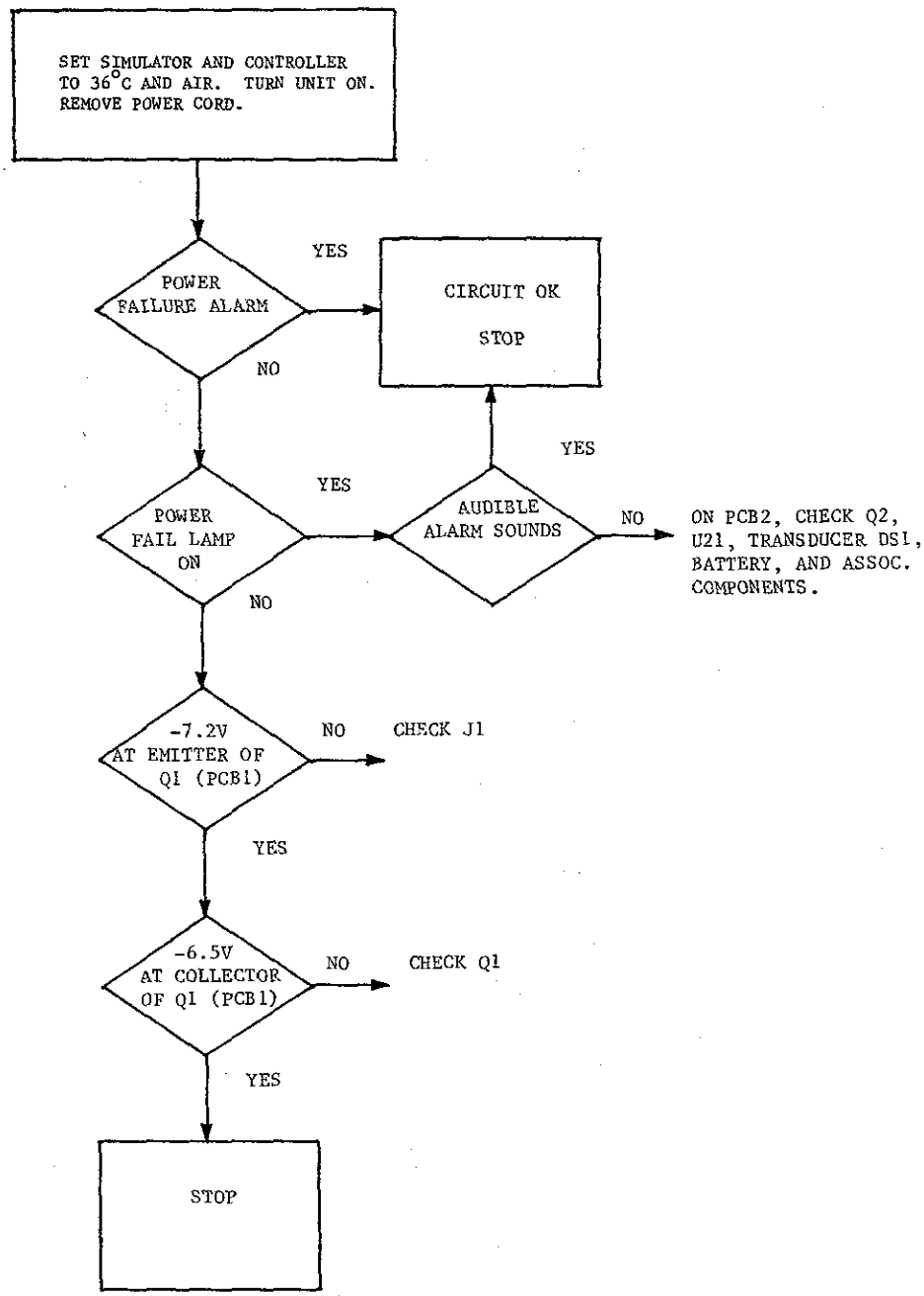
FLOWCHART 5.11 HEATER CIRCUITRY TROUBLESHOOTING (SHEET 3 OF 4)



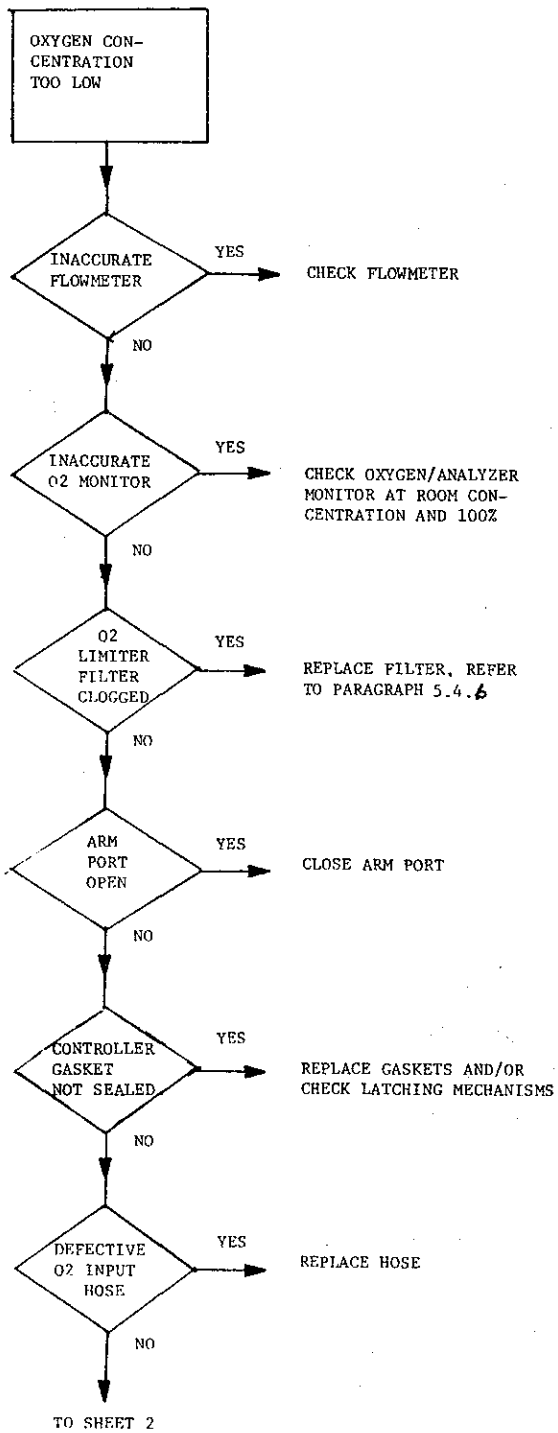
FLOWCHART 5.11 HEATER CIRCUITRY TROUBLESHOOTING (SHEET 4 OF 4)



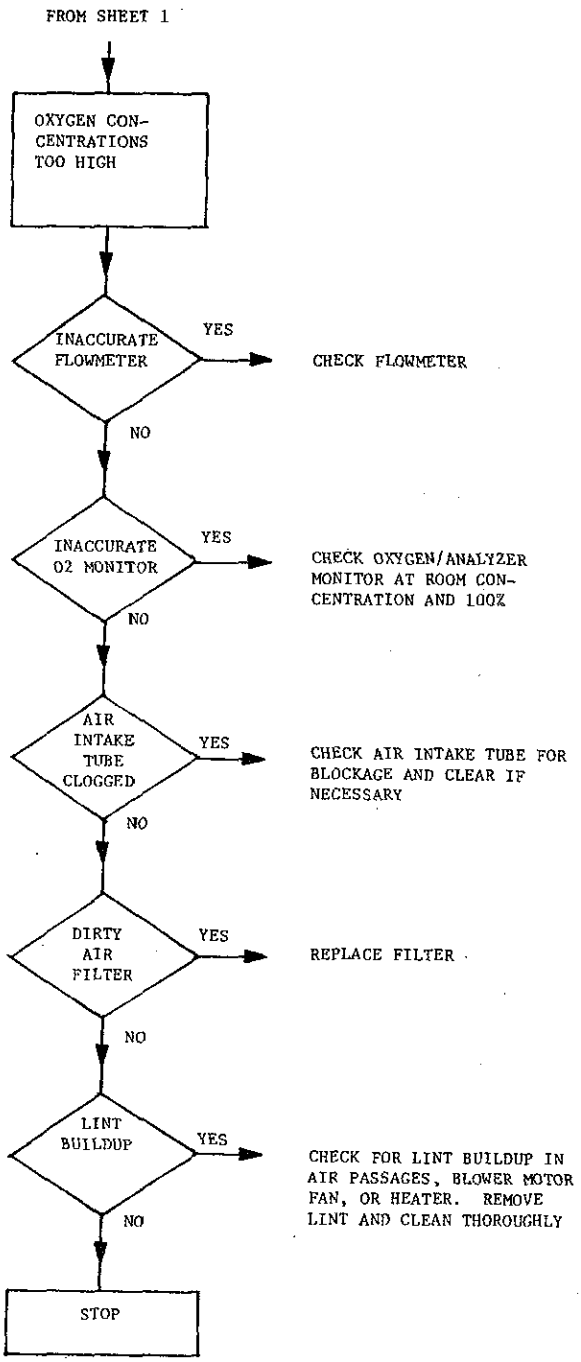
FLOWCHART 5.12 38 °C AIR TEMP SHUTDOWN TROUBLESHOOTING



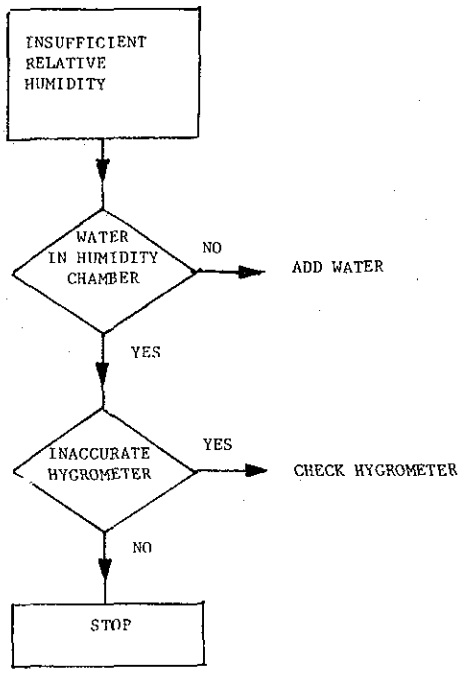
FLOWCHART 5.13 POWER FAILURE ALARM TROUBLESHOOTING



FLOWCHART 5.14 OXYGEN CONCENTRATIONS (SHEET 1 of 2)



FLOWCHART 5.14 OXYGEN CONCENTRATIONS (SHEET 2 OF 2)



FLOWCHART 5.15 INSUFFICIENT RELATIVE HUMIDITY

5.3.4 TROUBLESHOOTING THE ACTUATOR–VHA STAND

If the Actuator fails to move the VHA Stand up and down, check the following:

1. CIRCUIT BREAKER(S) – This circuit breaker(s) is for the VHA Stand only.
2. THERMAL CUTOUT – The Actuator Motor contains a thermal cutout which takes at least 30 minutes to cool down and reset.
3. PHASE SHIFT CAPACITOR – Capacitor could be open or shorted, replace capacitor.
4. OPEN OR SHORTED MOTOR WINDING – Motor winding resistance should be as follows:

	120Vac	220Vac	240Vac
Black lead to white lead	8–10 Ohms	34–38 Ohms	34–38 Ohms
Red lead to white lead	8–10 Ohms	34–38 Ohms	34–38 Ohms
Black lead to red lead	16–20 Ohms	70–75 Ohms	70–75 Ohms

5. WIRING – Check for broken wires or loose connections at the Up/Down Switch, Mains Panel, Capacitor or Motor.

5.4 REMOVAL AND REPLACEMENT PROCEDURES

5.4.1 GENERAL

This section provides removal and replacement procedures for components of the Incubator. Removal and replacement procedures for components other than those provided are obvious upon inspection.

5.4.2 CONTROLLER FRONT PANEL

1. Remove the Controller from the Incubator.
2. Remove the four phillips head screws located behind the handles.
3. If required, remove plugs P1 through P9, and P11. Disconnect in–line connector P15.
4. To replace the Controller Front Panel, reverse steps 1 through 3.

5.4.3 PCB2

1. Remove the Controller Front Panel as described above.
2. Remove the five phillips head screws that hold the printed circuit board to the panel.
3. Remove the CONTROL MODE knob*.
4. Remove plugs P1 through P9, P11, and P12. Disconnect in–line connector P15.
5. Remove PCB 1 as described below.
6. To replace PCB 2, perform steps 1 through 5 in reverse order.

5.4.4 PCB 1

1. Remove the Controller Front Panel and PCB2 as described above.
2. Remove ribbon cable from J1.
3. Use long nose pliers to remove the five snap–in board supports from PCB2.
4. To replace the board, push the snap–in board supports into PCB2 and reconnect the ribbon cable to J1.

5.4.5 POWER AND SILENCE/RESET SWITCHES

1. To remove the POWER switch, unscrew the bezel. Disconnect in–line connector P15. Remove the nut holding the switch to the Front Panel.
2. To remove the SILENCE/RESET switch, unscrew the bezel. Disconnect P11 from PCB2. Remove the nut holding the switch to the front panel.

* Model C100 Only.

5.4.6 OXYGEN INPUT VALVE FILTER CARTRIDGE

1. Refer to Figure 5.5 and remove the three screws which hold the Input Valve to the Air–Intake Filter Cover.
2. Replace the Filter Cartridge (part no. 68 130 67) and reassemble the Oxygen Input Valve as shown in Figure 5.5.

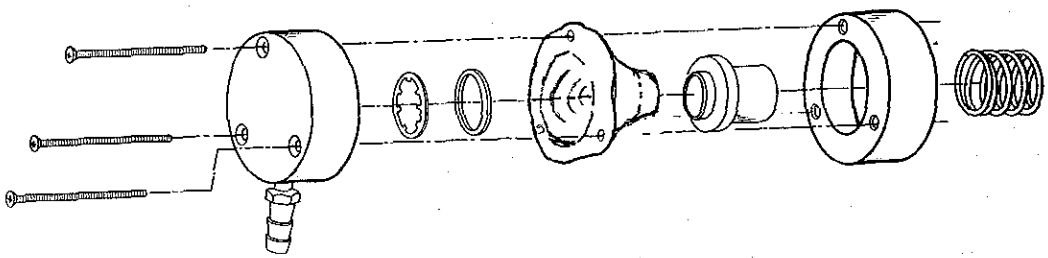


FIGURE 5.5 OXYGEN INPUT VALVE ASSEMBLY

5.4.7 VHA STAND ACTUATOR

Refer to Figure 6. for all references in parentheses ( ).

1. Remove the Incubator from the VHA Stand.
2. Remove the cable clamps (35) from the Platform (13).
3. Remove the 8 nuts (50) from the top of the Platform (13). Remove the Platform from the Stand.
4. Pull the Escutcheon (16) straight up and off the Stand.

CAUTION: Do not pull Inner Column Assembly (14) up to extend the Gibs (Item 2, Figure 6.16) beyond the top surface of the outer column. If this has been inadvertently done, the Inner Column Assembly must be completely removed and then reassembled using the Procedures described in Para. 5.4.10.

5. Remove the Ground Lug and Cable Clamp (36) at the top of the post by removing nuts (49).
6. Remove the Mains Panel (8). Disconnect the White Wire from the MAIN POWER Switch (Refer to Figure 5.7 for 120V Units or Figure 5.8 for 220V/240V Units).
7. Disconnect the Blue Wire and Brown Wires of the Incubator Power Cord from the MAIN POWER Switch (Refer to Figure 5.7 for 120V Units or Figure 5.8 for 220/240V Units.

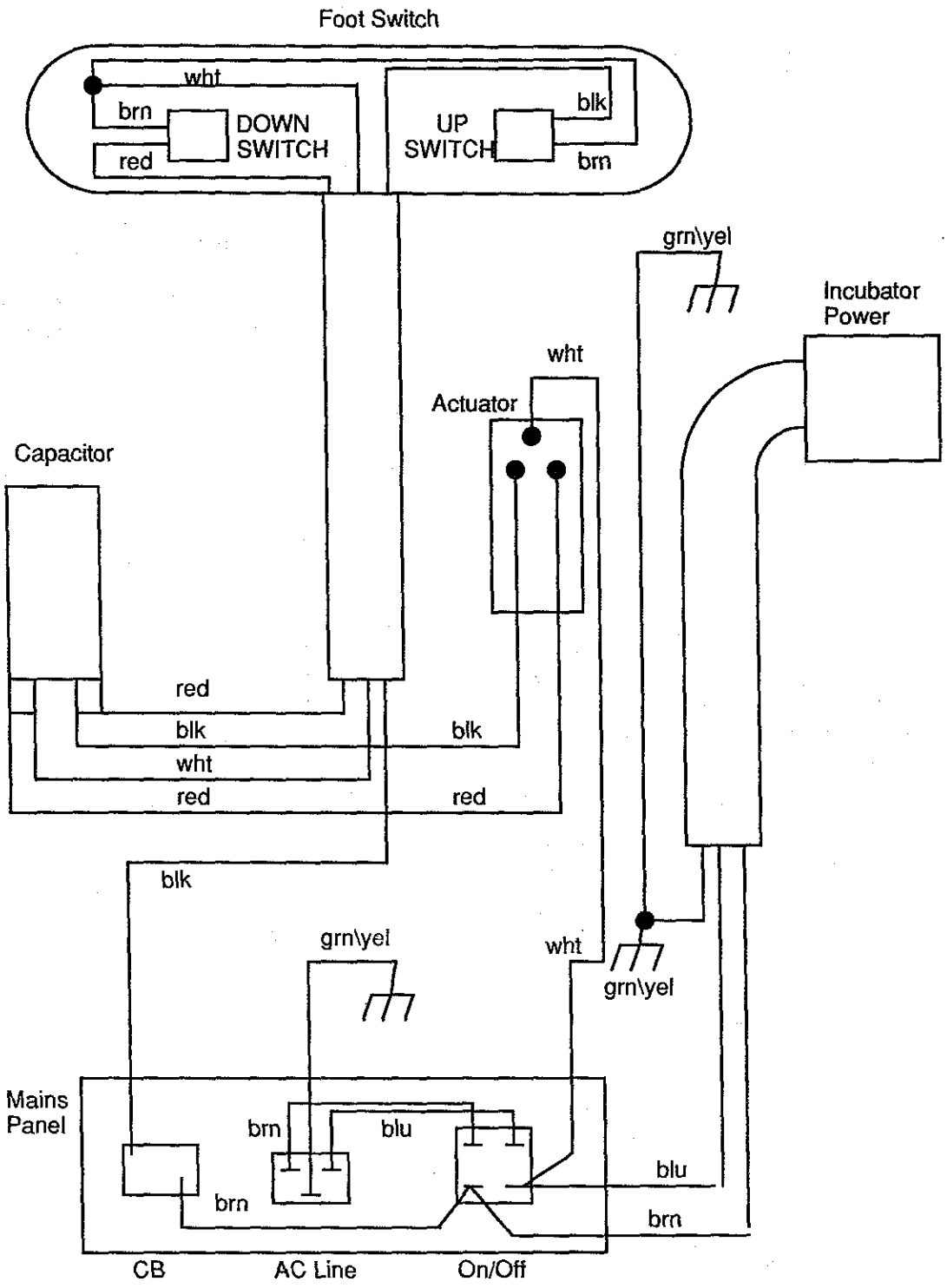


FIGURE 5.6 VHA STAND WIRING DIAGRAM – 120V UNITS
(Change 13)

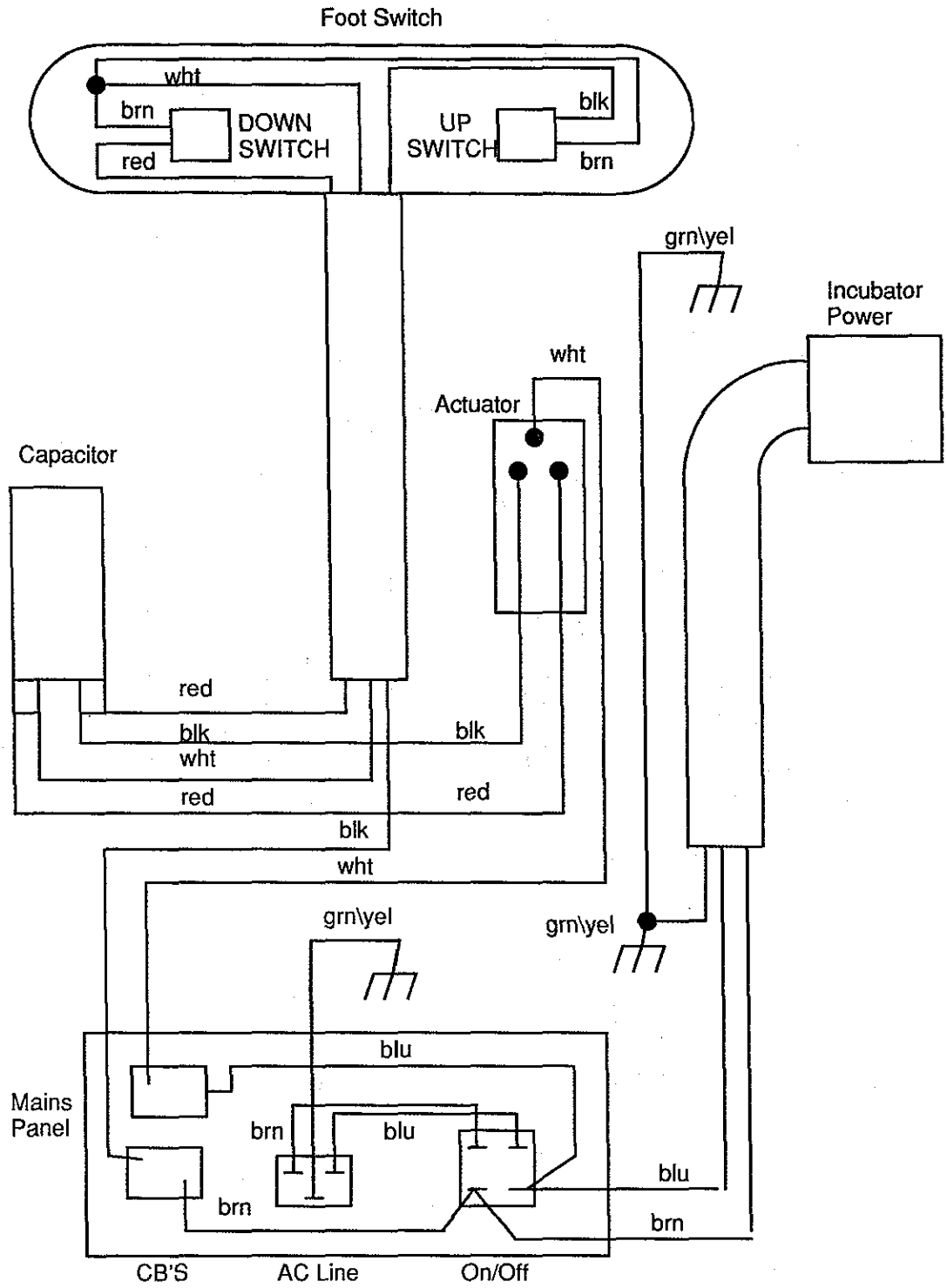


FIGURE 5.7 VHA STAND WIRING DIAGRAM – 220/240 UNITS
(Change 13)

8. Remove the two nuts (49) holding the Incubator Power Cord Ground Lug and the Ground Lug from the Actuator wiring harness (Green Wires) from the Stand. Remove the cable Clamp (36) that attaches the Actuator wiring harness to the Stand.
9. Remove the two nuts (50) that hold the Actuator from beneath the Stand. Pull the Actuator straight out of the Stand.
10. To install the Actuator, first perform steps 5 through 9 in reverse order.
11. Connect the unit to the ac line and then, while holding the actuator, extend the actuator to maximum. Temporarily install the Escutcheon on the actuator studs using two nuts (50). Carefully lower and guide the Escutcheon onto the six studs on the stand. Remove the nuts holding the actuator.
12. Install the platform (13) and secure it with 8 nuts (50).
13. Install the cable clamps (35) on the platform and replace the Incubator on the VHA Stand.

5.4.8 UP/DOWN SWITCH

Refer to Figure 6.15 for references in parentheses ( ).

1. Perform steps 1 through 4 of the VHA Stand Procedure.
2. Remove the Green and Blue wires from the Capacitor. Remove the Brown wire coming from the Up/Down Switch wiring harness from Circuit Breaker on the Mains Panel (Refer to Figure 5.7 for 120V Units or Figure 5.8 for 220V/240V Units).
3. Remove the four nuts (49) that hold the Switch Assembly to the Stand. Remove the Switch Assembly and wiring harness from the Stand.
4. Install the new Switch Assembly by performing steps 2 and 3 in reverse order. Then perform steps 11, 12 and 13 of the VHA Stand Actuator Procedure.

5.4.9 PHASE SHIFT CAPACITOR

Refer to Figure 6.15 for references in parentheses ( ).

1. Perform steps 1 through 4 of the VHA Removal Procedure.
2. Remove the Red, Blue, Black and Green wires from the capacitor (Refer to Figure 5.7 for 120V Units or Figure 5.8 for 220V/240V Units).
3. Remove the nuts (49) and strap (7) holding the Capacitor (4) in place.
4. Install the capacitor by performing steps 2 and 3 in reverse order. Then perform steps 11, 12 and 13 of the VHA Stand Actuator Procedure.

5.4.10 REASSEMBLY OF INNER COLUMN INTO OUTER COLUMN (REFER TO FIGURE 5.9)

CAUTION: Do not attempt to reassemble the Inner Column into the Outer Column without using the Gib Pins (Air–Shields Part No. 68 900 02). Improper assembly may cause damage to the Gibs. ■

1. If necessary, remove the inner column assembly from the outer column.
2. Use a screwdriver to push each Gib back and insert the Gib Pins into the slots (refer to Figure 5.6) to retain the Gibs.
3. Insert the Inner Column into the Outer Column until the four lower Gib Pins rest on the top surface of the Outer Column.
4. Remove the four lower Gib Pins. Push the Inner Column down into the Outer Column until the upper Gib Pins contact the top surface of the Outer Column. Remove the Gib Pins.
5. Continue to push the Inner Column down until the Gibs are below the two surface of the Outer Column.

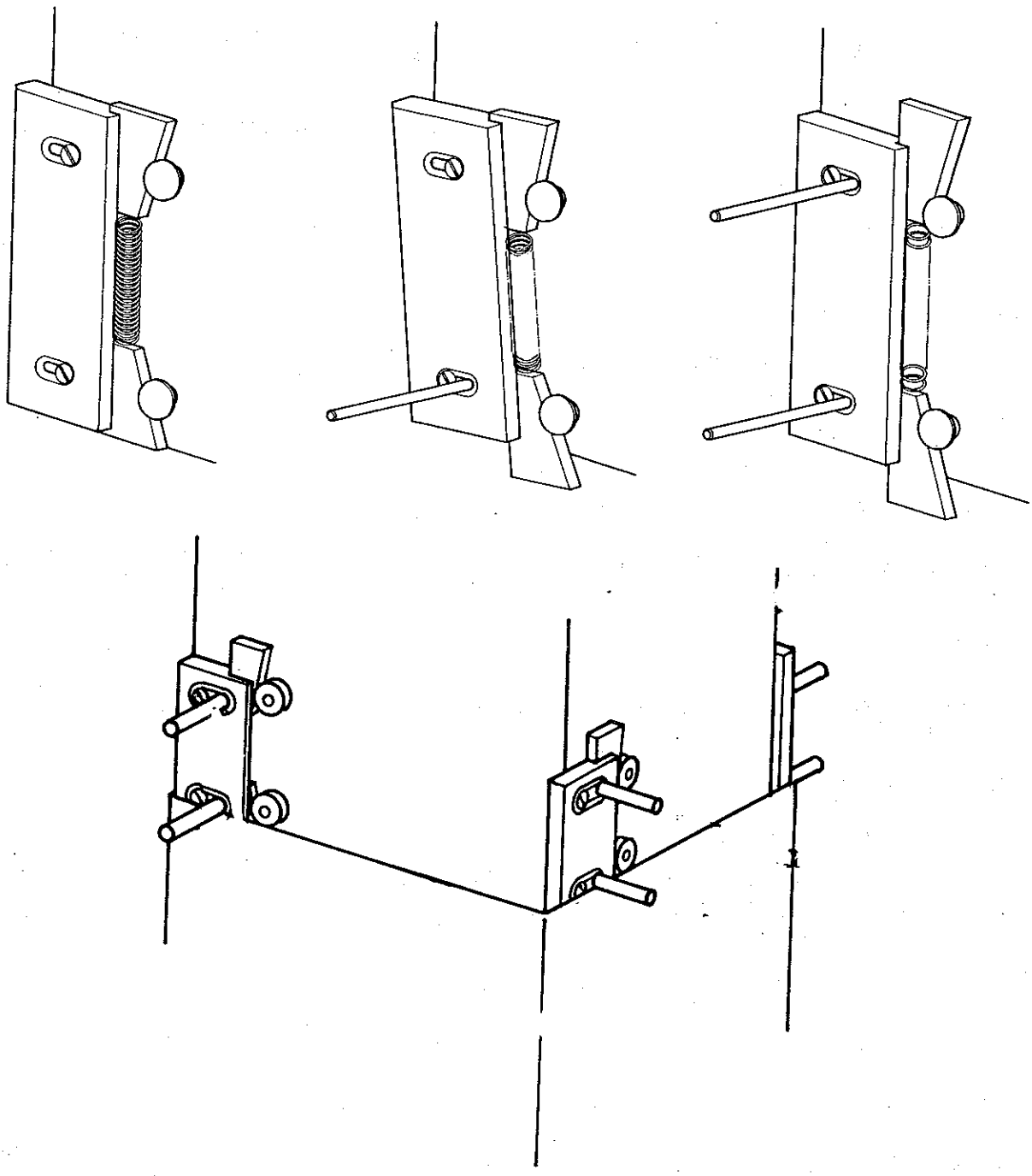


FIGURE 5.8 INSERTION OF GIB PINS